# *Innovation and Incentives:*
## *Role of the Research Funder in Knowledge Translation and Scaling Science*


**Robert Kenneth Douglas McLean** B.A., B.Com., M.Sc.
Supervisors: Prof Jimmy Volmink & Prof Ian Graham

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Faculty of Medicine and Health Sciences
Stellenbosch University
South Africa

# DECLARATION

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This dissertation includes:

- Four original papers published in peer-reviewed journals in open access, respectively: *Implementation Science*, *Health Research Policy and Systems*, *Research Evaluation*, and *Nature*;
- One original manuscript written specifically for the purposes of this dissertation (chapter 5) that provides a summary of a peer-reviewed book that I first-authored and published in open access through *Routledge (an imprint of Taylor & Francis);*
- One open access guidance document published by the International Development Research Centre.

The writing of these published components was the principal responsibility of myself and for each of the cases where this is not the case a declaration is included in the dissertation indicating the nature and extent of the contributions of co-authors.

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# ABSTRACT

Research and innovation are vital to global sustainable development and human prosperity. However, it is well documented that the creation of knowledge does not ensure its effective and ethical application. In fact, studies indicate that knowledge is converted into action in slow, haphazard, and inequitable ways. This dissertation casts new light on this challenge by investigating an understudied component of knowledge translation (KT), the role of the research funder.

This dissertation applied a multi-stream study design and mixed-methods data collection and analysis strategy. The research used an Integrated Knowledge Translation (IKT) approach which facilitated a focused and dynamic investigation, at the same time promoting relevance and uptake with the intended research-user, research funders. Stream one, *Funders' KT*, initiates the dissertation using a single funder case study to construct a KT-focused evaluation protocol, and an international empirical scan of 26 health research funding agencies resulting in a state-of-the-art overview of how funders support KT. An unexpected and significant finding was the lack of empirical evidence guiding funders' KT support. From this result, research streams two and three were born. Stream two, *Scaling Science*, investigates facilitators of research impact using a large multi-project review and in-depth case studies. Results include a typology of pathways to scale and four guiding principles for scaling impact. These innovations are converted into an action-oriented tool that will help researchers build evidenced practices into their research. Stream three, *Research Quality Plus (RQ+)*, describes a novel evaluation framework for assessing research quality with KT in mind. The RQ+ approach is implemented in seven funder-based evaluations and the aggregate evaluation results are synthesized via meta-analysis. Results demonstrate that KT and scientific rigour can be pursued, accomplished, and assessed as equally valued dimensions of research quality. The validation of the RQ+ approach showcases a fresh and practical framework for funders and other science systems actors interested in KT and scaling science.

Overall, the results of this dissertation fill a critical knowledge gap related to the role of the funder in research translation and impact. In turn, they demonstrate original and significant contributions to global academic knowledge and understanding of KT theory and practice. To convert this knowledge into action, practical guidance is developed, elaborated, and validated.

# ISICATSHULWA

Uphando neenguqu ezingobuchule zibalulekile kuphuhliso oluluqilima lwehlabathi jikelele nakwimpumelelo yabantu. Noko kunjalo, kushicilelwe ngokuthe gca ukuba ukudalwa kolwazi akuqinisekisi ukusebenza kwalo okukuko nokusetyenziswa kwalo kakuhle. Enyanisweni, izenzo zophononongo ziye zabonakalisa ukuba ulwazi luguqulwa ukuze lube ziintshukumo ngeendlela ezicothayo, ezingenacwangco nezingenabulungisa. Esi sincoko sakhela lo mngeni umkhanyo omtsha, ngokuphanda ngokungqalileyo inxalenye yoguqulo lolwazi (KT) esele iphononongwe kancinci, eyindima yomxhasi-ngezimali wophando.

Esi sincoko sisebenzise uyilo lophononongo oluneenkalo eziliqela neqhinga lokuqokelela nokuhlalutya iinkcukacha elingengxubevange yemigaqo. Uphando luye lwaqhutywa ngokusebenzisa uGuqulo loLwazi ngokuHlangeneyo, -Integrated Knowledge Translation (IKT), ukuxhasa imfaneleko nosetyenziso ngumsebenzisi wophando ekujoliswe kuye: abaxhasi-ngezimali bophando. Uyilo lophononongo lwe-IKT oluneenkalo eziliqela luye lwabangela uphando olungqalileyo noluguquguquka lula. Inkalo yokuqala, *yabaxhasi-ngezimali yoGuqulo loLwazi, i-Funders' KT*, iqalisa esi sincoko ngokusebenzisa isishwankathelo nesikena esijoliswe kwimeko yehlabathi jikelele see-arhente zabaxhasi-ngezimali ezingama-26. Isiphumo ibe luphengululo lodidi oluphezulu lwendlela abaxhasi-ngezimali abaxhasa ngayo i-KT (uGuqulo loLwazi). Okuthe kwafunyaniswa obekungalindelekanga nokubalulekileyo kukunqongophala kobungqina obuphathekayo obukhokela inkxaso yabaxhasi-ngezimali ngokujoliswe kwi-KT. Kweso siphumo, kuye kwavela inkalo yophando yesibini neyesithathu. Inkalo yesibini, *Inzululwazi yokuKala*, i-*Scaling Science*, iphanda abachopheli beziphumo zophando ngokusebenzisa uphengululo lweeprojekthi eziliqela nezishwankathelo zophononongo ngokunzulu. Iziphumo ziquka uludwe lwemizila yokukala neenqobo ezine ezikhokelayo kwiziphumo zokalo. Konke oku kuguqulwa ukuze kube sisixhobo esisekelezwe kwiintshukumo. Inkalo yesithathu, *umGangatho woPhando onoChatha, i-Research Quality Plus (RQ+)*, uchaza izikhokelo zovavanyo ezitsha nezingaqhelekanga zokuhlola umgangatho wophando kuthathelwa i-KT ingqalelo. Indlela ye-RQ+ imiselwa ngeemvavanyo ezisixhenxe ezisekelwe kubaxhasi-ngezimali ize iqinisekiswe ngohlalutyo lweziphumo eziliqela (meta-analysis). Usetyenziso lwe-RQ+, nokushicilelwa kwalo kwirekhodi yemfundo neyomsebenzi, zibalula imeko entsha nengaqhelekanga yokucingwa kwakhona kovavanyo lophando.

Iziphumo zesi sincoko ziphuhlisa isiseko solwazi lwendlela abaxhasi-ngezimali abanokuxhasa ngayo i-KT, zize zivule imizila emitsha yemisebenzi namaphepha-nkqubo elungiselelwe abaxhasi-ngezimali nangaphezulu. Izindululo ziyondlalwa ngokufanelekileyo.

# OPSOMMING

Navorsing en innovasie is noodsaaklik vir wêreldwye volhoubare ontwikkeling en menslike vooruitgang. Nietemin is dit bekend dat die skepping van kennis geen waarborg is dat dit doeltreffend en eties toegepas sal word nie. Trouens, studies dui daarop dat kennis betreklik stadig, lukraak en ongelyk in aksie omgeskakel word. Hierdie verhandeling werp nuwe lig op hierdie uitdaging deur die rol van die navorsingsfinansier, ’n weinig bestudeerde komponent van kennistoepassing (“knowledge translation”, of “KT”), van nader te bekyk.

Die verhandeling gebruik ’n multistroomstudieontwerp en ’n gemengdemetodestrategie vir data-insameling en -ontleding. Die navorsing is met behulp van ’n geïntegreerde kennistoepassings- (“IKT”-)benadering onderneem om relevansie en benutting onder die beoogde eindgebruikers, synde navorsingsfinansiers, aan te moedig. Die IKT-multistroomontwerp het ’n toegespitste en dinamiese ondersoek tot gevolg gehad. Die verhandeling open met die eerste stroom, *Funders’ KT*, wat ’n gevallestudie en ’n internasionale empiriese verkenning van 26 finansieringsagentskappe behels. Die resultaat is ’n aktuele oorsig van hoe finansiers KT ondersteun. ’n Onverwagte en beduidende bevinding was die gebrek aan empiriese bewyse om as grondslag vir finansiers se KT-ondersteuning te dien. Uit hierdie resultaat is die tweede en derde navorsingstrome geskep. Die tweede stroom, *Scaling Science*, bestudeer die fasiliteerders van navorsingsimpak met behulp van ’n multiprojekoorsig en dieptegevallestudies. Resultate sluit ’n tipologie van skaleringsroetes en vier rigsnoere vir skaleringsimpak in. Dít word dan in ’n aksiegerigte instrument omskep. Die derde stroom, *Research Quality Plus (RQ+)*, beskryf ’n innoverende evalueringsraamwerk om navorsingsgehalte met KT in gedagte te beoordeel. Die RQ+-benadering word in sewe finansiergebaseerde evaluerings geïmplementeer en deur middel van meta-ontleding gestaaf. Die RQ+-toepassing, en die beskrywing daarvan in die akademiese en praktykrekord, bied ’n vindingryke metode om nuut oor navorsingsevaluering te dink.

Die bevindinge van die verhandeling bied ’n kundigheidsbasis vir hoe finansiers KT kan ondersteun, en skep nuwe praktyk- en beleidsroetes vir navorsingsfinansiers én ander rolspelers. Aanbevelings word dienooreenkomstig aangebied.

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# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ANOVA | Analysis of Variance |
| BMGF | Bill and Melinda Gates Foundation |
| CAD | Canadian Dollars |
| CADRE | Capacity for Applied and Developmental Research and Evaluation |
| CAHS | Canadian Academy of Health Sciences |
| CCGHR | Canadian Coalition for Global Health Research |
| CEDES | Centro de Estudios de Estado e Sociedad |
| CIHR | Canadian Institutes of Health Research |
| CREST | Centre for Research, Evaluation, Science and Technology |
| DE | Dissemination Events |
| DFID | Department for International Development (UK) |
| DIA | Desired, Intended, Anticipated |
| EIS | Electronic Information System |
| FIC | Fundación InterAmericana del Corazón |
| GAC | Global Affairs Canada |
| IDRC | International Development Research Centre |
| IECS | Institute for Clinical Effectiveness and Health Policy |
| IKT/iKT | Integrated Knowledge Translation |
| IKTRN | Integrated Knowledge Translation Research Network |
| IMCHA | Innovating for Maternal and Child Health in Africa |
| INGO | International Non-Governmental Organisation |
| IRE | Intended, Realized, Emergent |
| JBI | Joanna Briggs Institute |
| K2A | Knowledge to Action |
| KT | Knowledge Translation |
| KTR | Knowledge Translation Research |
| KTS | Knowledge Translation Supplement |
| LAC | Latin America and the Caribbean |
| LGA | Local Government Authority |

| | |
|---|---|
| MoU | Memorandum of Understanding |
| MPD | Meetings, Planning, Dissemination |
| MSFHR | Michael Smith Foundation for Health Research |
| NCD | Non-Communicable Disease |
| NGO | Non-Governmental Organisation |
| OOGP | Open Operating Grant Programs |
| PAA | Program Activity Architecture |
| PHSI | Partnerships for Health Systems Improvement |
| PI | Principal Investigator |
| PRA | Participatory Rural Appraisal |
| R&D | Research and Development |
| R4D | Research for Development |
| RAHAT | *Meaning "Relief" in Urdu* |
| RBM | Results-Based Management |
| REF | Research Excellence Framework |
| RQ+ | Research Quality Plus |
| SARS-CoV-2 | Severe Acute Respiratory Syndrome CoronaVirus 2 |
| SDG | Sustainable Development Goals |
| SFDORA | San Francisco Declaration on Research Assessment |
| SGCI | Science Granting Council Initiative |
| TBS | Treasury Board Secretariat (Canada) |
| UN | United Nations |
| USAID | United States Agency for International Development |
| USD | United States Dollars |
| WHO | World Health Organisation |

# PART I

# INTRODUCTION

**Chapter 1 –**

# *Introduction*

**Summary**

This chapter presents the rationale for, and parameters of, the dissertation. It begins by positioning the research against the current literature, indicating where and how the dissertation contributes intellectually and practically. Second, it provides a personal reflection on my positionality as leader of the dissertation research. Third, it outlines how the research is structured, presenting the objectives and questions that guide the dissertation and its three interconnected streams. Finally, it provides a roadmap to the remainder of the dissertation.

As per Stellenbosch University guidelines for the dissertation-by-publication, each chapter contains a specific and detailed introduction. The aim of this chapter is to introduce how the pieces fit together, and how in combination, they construct a coherent and novel body of work.

## 1. Rationale

### 1.1. Knowledge translation

Science holds tremendous potential to affect global prosperity. This is the case, particularly, in the medical and health domains where scientific advances have provided a revolution of ideas, institutions, goods and services that have extended lifespans and improved quality of life across the globe (Weinberg et al. 2014; KCL 2015; Greenhalgh et al. 2016; European Commission 2017). Yet, the conversion of science into meaningful impacts for people and the planet is not a foregone conclusion. To the contrary, the process of turning health research into action has been described as slow (Mitton et al. 2007; LaRocca et al. 2012), haphazard (Runciman et al. 2012; Layton & Clarke 2016), biased, and inequitable (Asch et al. 2006; Amano et al. 2016; Saini et al. 2017).

For individuals, this mismatch between *what we know* and *what we do* leads to suboptimal care. In the United States of America, for example, only 55% of patients receive the care that the research tells us they should (McGlynn et al. 2003). A recent reproduction of this study in Australia found that only 57% of health-care encounters resulted in the most appropriate care for the patient (Runciman et al. 2012). Thinking globally, Braithwaite and colleagues have termed this dilemma the "60-30-10 challenge"'. They categorize the issue by scanning studies with national and international parameters, and estimate that only 60% of care is aligned with research evidence, whereas 30% is unnecessary, duplicative, or low-value, and 10% is in fact harmful (Braithwaite et al. 2020; Braithwaite 2018).

At the same time, the failure to convert research into action represents a painful societal expense. Estimates underpinning a 2014 Lancet series entitled *Research: Increasing Value, Reducing Waste* suggest a 200 billion USD waste of global health funding on research because the research is not used, or is not

useful (Chalmers et al. 2014; MacLeod et al. 2014). This is lost investment that could otherwise have been put to use across the health system, building much-needed institutions and updating existing infrastructure. Our collective failure to fulfill the promise of science for society draws into question the role of research in a modern world, and exposes the vulnerability of the health research ecosystem as a whole. Addressing this research to action 'know-do' gap is without a doubt an ethical imperative of our times.

Reviews of the research indicate that a variety of terms are in use to describe this challenge (McKibbon et al. 2006; Scott et al. 2012; Tait & Williamson 2019; Hoekstra et al. 2020). Popularized examples include: implementation science, knowledge mobilization, knowledge transfer, and commercialization, to name a few. Each has its nuances in different contexts, and each has been used to serve different purposes. For example, knowledge mobilization usually describes the process of research being converted into action, whereas implementation science typically describes the scientific study of the research to action process. One sub-component of this dissertation explores the international uptake and varying use of these terms.

Perhaps the best known, globally, is a term advanced by the Canadian Institutes of Health Research (CIHR). CIHR describe 'Knowledge Translation' (KT) as:

> *"...a dynamic and iterative process that includes synthesis, dissemination, exchange, and ethically-sound application of knowledge."* (McLean & Tucker 2013)

This CIHR definition has been adopted by the World Health Organization, and a multitude of funders and science systems actors around the world. Given its broad scope and assumed endorsement, it is the overarching conceptualization, and the specific term, used in this dissertation. By selecting this term over others, I do not intend to make a claim about its superiority. Rather, I do so to ensure conceptual clarity and logical flow of the research. Others may find value in using other terms, and they should do so accordingly.

### 1.2. The role of the research funder in KT and scaling science

Actors from all parts of public health systems have responded to the challenge. This includes health professionals and health service delivery organizations who want more accessible and useful knowledge to inform their work (Sutherland et al 2012). At the same time, it has included researchers who have endeavored to do better KT, out of a desire to ensure the utility of their work (Wilson et al. 2010; Corluka et al. 2015; Jessani et al. 2020), and who rigorously study and document the process in emerging fields of KT science (Kitson et al. 1998; Helfrich et al. 2010). However, the research presented in this dissertation places specific focus on one group: public research funders. This entry point has been selected for three reasons.

The first is academic. There is limited knowledge regarding the research funder's role in KT (Cordero et al. 2008; Tetroe et al. 2008; Smits & Denis 2014; Smits & Champagne 2020). As Smits & Denis (2014) suggest, the role of the funder has not been comprehensively explored. When the funder has been considered, they are treated as a periphery or contextual factor playing a supporting role in a process driven by researchers and research users. To address this knowledge gap, this dissertation gathers new empirical evidence from an international sample of public funders, and undertakes in-depth explorations of KT practice at two research funders.

The second rationale is utility. Alongside the evidence gap, there is a demand for better knowledge of how to support and evaluate KT efforts from funders (Tetroe et al. 2008). Accordingly, the dissertation has engaged this knowledge-user group, and aims to meet the demand with timely and practical evidence. In other words, it is a use-oriented project. The research questions and methods of the dissertation have been designed accordingly, and this is presented in the following section of this chapter. As a result, significant effort and output of my research has fallen outside of the traditional research reporting approach, and the content included for examination in this dissertation will reflect this. This work has included items such as sense-making meetings, knowledge exchanges, policy briefs, workshops, videos, and fact-sheets.

The third rationale is moral. Funders hold power, and this power can bring about desirable action and change. When the goal is the public good – as it is for funders included in this dissertation[1] – the results will manifest a wide range of positive impacts for health institutions, economics, systems, and most importantly, people.

Following this three-pronged logic – academic, utility, moral – the research completed over the course of this dissertation aims to create new knowledge, useful knowledge, and to contribute meaningfully to a morally justified area of study and action.

**RESEARCH PROBLEM STATEMENT**

*Health actors of all types – physicians, nurses, administrators, policymakers, politicians, and so on – make sub-optimal use of research evidence. So much so, that the shortcoming has developed its own field of study and practice known as implementation science and knowledge translation respectively. One of the least understood components of KT is the role of the financier. Research funders determine who does health research, and accordingly, they incentivize what type of work is conducted and what type of results are produced. The aim of this dissertation, focusing on the role of the funder in supporting KT, is to create new knowledge and fill critical and current practice gaps.*

## 2. Positionality

In this sub-section, I provide an account of my positionality. By elucidating any subjectivity I may have introduced into the research, I hope to achieve the utmost transparency. In the process, I present a

[1] Funders control access to the finances that allow the research enterprise to operate. In the private sector, funders drive KT implicitly, by supporting research that brings about an economic return and vacating that which does not. Simply put, private funders support scientific discovery *for* KT. Although the track record of matching private research funding with social impacts beyond economic gain is less well understood, and is at times criticized, it is relatively clear that industry supports KT and has well-established models for doing so. For this reason, this project has not examined private sector or industry-driven health research. This dissertation has focused on both publicly funded funders (i.e., those who receive government allocations), and philanthropic funders who place focus on the public good (i.e., those who hold a trust or endowment from a philanthropist).

personal narrative for how the dissertation evolved over time, including the emergence of research streams two and three as new additions to my original PhD research proposal at Stellenbosch University.

A reflection on positionality requires an examination of who I am – including my identity and social position vis-à-vis the research subject – and how these constructs and characteristics interact with the aims, process, and results of my research. Burke (2014) argues that the positionality is a dynamic concept and might best be considered and revisited as a progression of personal reflections. This approach embraces the position held by England (1994) that "research is a process, not just a product." As such, hereafter I present a reflection on my positionality as a formal component of this final dissertation, which also serves as a chronicle of the evolution of this dissertation.

Savin-Baden and Major (2013) suggest three components of a positionality statement that can be used to unearth researcher subjectivity. These are: personal positionality, participants/users interactions, and contextual positionality. I abridge this approach to combine the second and third areas into a blended presentation and discussion. In the case of my research, I believe this allows a more accurate and fluid account of how my work, my professional relationships, and my professional responsibilities and privileges have affected the process and product of this dissertation. I believe that acknowledging these underlying factors will enhance transparency, legitimacy, and clarity of the research results.

### 2.1. Personal positionality

First, I acknowledge personal attributes that may have affected the production of this dissertation. I am a white, heterosexual, cisgender male in my mid-thirties. I grew-up in a middle-class household in Ottawa, Canada and currently reside in Cape Town, South Africa. By all social and economic measures, I am from a privileged background. I have been able to find work, and therefore fund an education, without prejudice. I studied at the university level for two undergraduate degrees, a master's degree, and a professional certificate. My PhD research was carried out full-time as an international student at Stellenbosch University. I funded these studies while working full-time in Canada and South Africa.

My position of social privilege underpins the opportunities I have had to pursue these professional and scholarly avenues. I recognize that neither my academic life nor my professional life have ever been compromised or impeded by issues of race, gender, religion, economic class, or other socio-economic criteria. I believe this position of privilege may have increased the willingness of participants and users to work with me over the course of my PhD project as I am generally perceived to be on "good" social standing.

However, I do not believe personal positionality has influenced research integrity. As described in chapter 2 in general, and in each chapter of this dissertation in specifics, I have used methodological and ethical procedures to guard against any personal bias which might have compromised the legitimacy or integrity of my research. I have used best practices described in the scientific literature to guide these measures. I believe that I have been largely successful in controlling and declaring any personal bias. By publication of the work in peer-reviewed and professionally edited venues, I have received an external validation that undue positional bias has been appropriately mitigated. That said, I cannot declare what I cannot see or do not know. I provide this reflection to mitigate the risk of undeclared positional bias and to enhance a contextualized interpretation of the results.

### 2.2. Relational and contextual positionality

Secondly, in keeping to the Savin-Bader & Major (2013) approach, I turn attention to how my positionality may have affected the dissertation through interactions and relationships with research participants/users and the broader context unfolding around the body of work. I estimate that my positionality *has* affected the research in ways that are related to my concurrent career and professional work with research funders. A large part of this relates to the research approach I brought to the dissertation called: Integrated Knowledge Translation (IKT). Kothari et al. (2017) describe IKT as *"a model of collaborative research, where researchers work with knowledge users who identify a problem and have the authority to implement the research recommendations."* Often, the term 'co-production' is used as a synonym for IKT. How the IKT approach relates to research methods is discussed in chapter 2 of this dissertation. In the remainder of this section, I examine the ways in which my partnerships with research-users affected the construction and communication of the research results presented in this dissertation.

From 2010 to 2014, I worked with the Canadian Institutes of Health Research, Canada's national health research funding agency. At CIHR, I was charged with designing, implementing, and communicating evaluations of CIHR's performance. In this position, I initiated the work which culminates here as research stream one – *Funders' KT*. Chapter 3 outlines the study protocol for an evaluation project launched under this mandate. Chapter 4 presents the results of a study originally initiated as a component of this same CIHR evaluation.

As such, it is evident that CIHR played an influential role through the course of the *Funders' KT* research stream. Undertaking the evaluation with an IKT approach influenced what questions were asked, what and how data was collected, and how results were communicated. To facilitate this, the *Funders' KT* stream involved a working group of identified 'research-users'. Members included CIHR KT leadership and operational staff, Canadian researchers with interest/expertise in KT, and CIHR evaluators. The results of this study were published in a CIHR report, and just as the working group was intended to influence the work, these research results were intended primarily to influence CIHR improvement in KT (McLean & Tucker 2013). The IKT approach is declared and described in the evaluation protocol and the final evaluation report.

Likewise, data collection for the international funders' scan (chapter four) – being originally conceptualized for the CIHR evaluation – benefitted from the endorsement of CIHR, in particular when we sought funder participation. The study may not have achieved the same response rate without the endorsement of CIHR.

The *Funders' KT* research stream was directly influenced by my position at CIHR. It is my personal view that creating the project in concert with CIHR research-users enriched the relevance and utility of the work. Readers of this dissertation should interpret these chapters with this declaration in mind.

In 2014, I accepted a position at the International Development Research Centre, a research funding organization headquartered in Canada that supports research globally. In my position at IDRC, research stream two – *Scaling Science* and research stream three – *RQ+* were envisioned, designed and implemented. Both involved IDRC as a research-user through an IKT research approach and both

represent a pivot from my original PhD proposal and protocol (see McLean 2020 for revision). Although these shifts were logical given the emerging findings of the *Funders' KT* stream (as discussed in detail in the integrated discussion provided in chapter 9), they were also designed to meet the knowledge needs of IDRC. In brief, the original proposal outlined a continuation of the international funders scan, but instead, I turned attention to investigating impact pathways and principles (*Scaling Science*) and a KT-inclusive evaluation approach (*RQ+*) with/for IDRC. Over the course of this work, IDRC held the role of case-study subject and engaged knowledge-user. In the remainder of this section, I reflect on how my interaction with IDRC as a participant and user evolved over the course of the dissertation and examine the broader context such as the funder landscape and the available literature.

In the literature, knowledge translation is often described as the process of turning research into action, and it includes both knowledge creation and application (Graham et al. 2006). For example, research can be used to inform the development of a product or device, a new policy or practice, or a more accessible or equitable program. In this dissertation – specifically research stream two – I have supplemented the KT term with another: 'scaling'. The investigation of this supplementary notion emerged as part of my work with IDRC, and the knowledge needs of IDRC versus the broader literature and existing professional guidance. Returning to Graham and colleagues (2006) description of KT, IDRC was particularly interested in the 'application' component. Specifically, they sought a better understanding of how they might steward research impact. As a result, this research stream was positioned to support a richer understanding of 'scaling' with/for IDRC. Chapters 5 and 6 will outline how it has been developed through this dissertation to embody an emerging and inclusive domain for further scientific research.

This is not the first use of the term 'scaling' in the context of health research. This study adds to a growing literature on the concept of scaling in the health sciences (see for example: Ben Charif et al. 2017 and Greenhalgh and Papoutsi 2019 for reviews). Where this work adds novelty is in its entry point to the problem: the research funder and the synthesis of research experience from across the Global South. Leading this research as an employee of IDRC granted me access and privilege to this unique perspective. Likewise, my previous experience leading KT evaluation at CIHR directly influenced IDRC's confidence and willingness to undertake the study presented hereafter.

I would not have been able to complete the research presented in stream two – *Scaling Science* without the privilege granted by my professional positionality. This positionality also interacts with the broader context. This dissertation contributes to an emerging concept of scaling with new empirical evidence and holds the potential to influence funders and researchers beyond IDRC.

Research stream three – *Research Quality Plus (RQ+)* emerged under similar conditions. Around the world, a growing body of research systems actors – in health and beyond – have noted a disconnect between the methods we use for research evaluation and our aspirations for research (see for example the signatories and statement of the San Francisco Declaration on Research Assessment). Perhaps the most widely heard call to action is the 2015 Leiden Manifesto. This highly cited paper outlines 10 principles for improving research evaluation. The principles call for a reconnection of science with society and describe how measurement can play a critical role (Hicks et al. 2015). As this global movement was taking shape, I became interested in how a funder, like IDRC, could improve their research evaluation approach in order to identify, reward, and encourage KT. The result is research stream three, *RQ+*, developed with IDRC endorsement as a practical response to the Leiden Manifesto.

My position as a research evaluator at IDRC granted me privileged access to resources, such as conference attendance support, professional connections, and most importantly, IDRC's community of researchers across the globe. I believe that these opportunities have positively impacted the *RQ+* stream and my ability to lead this research.

## 3. Research Objectives and Questions

### 3.1. Innovation & Incentives: A dissertation comprising three interconnected research streams

This section of the chapter presents the research objectives and questions. These objectives and questions have guided the entire body of work and align the critical inquiry to the identified research rationale, research problem statement, and identified literature and practice gaps. Concurrently, this section outlines how the dissertation is organized and presented hereafter.

The overarching research aim is:

*To advance knowledge of how research funders can support knowledge translation and scaling science.*

To pursue this objective, the dissertation comprises three interconnected research streams. The three streams facilitate greater specificity in empirical review, and tailored positioning of the results for identified research-users. The three research streams are:

1. *Funders' KT*
2. *Scaling Science*
3. *Research Quality Plus (RQ+)*

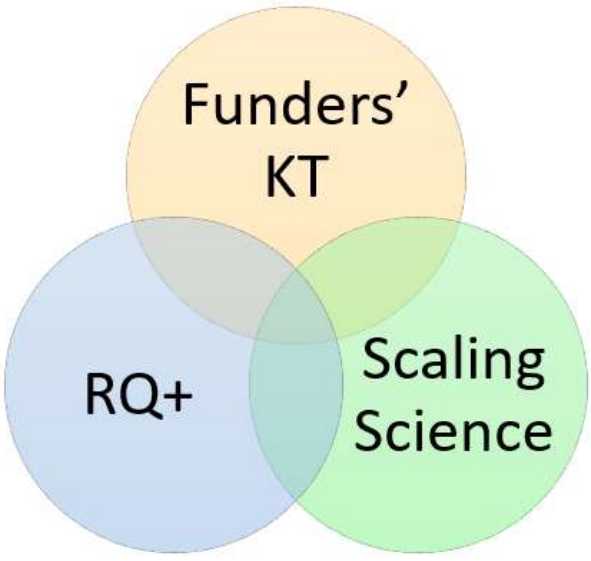


**FIGURE 1** Innovation & Incentives – A dissertation comprised of three interconnected research streams

### 3.2. Research questions

The research questions are partitioned by research stream, such that:

**Research stream one – *Funders' KT***

*Stream-specific objective:* ***How do research funders support KT?***

1 – What roles do research funders currently play in the KT processes of the research they support?

2 – Which roles have been evaluated? If evaluations exist, what can be deduced about the efficacy of KT support activities?

3 – Does the synthesis of primary data collected across funders, or funders programs/activities, provide new or higher quality knowledge about common or divergent practice and successful or unsuccessful practice?

4 – Can any trends in funder support for KT be identified?

**Research stream two – *Scaling Science***

*Stream-specific objective:* ***What strategies might optimize funders' support for KT and impact?***

5 – What pathways have been followed to translate research into meaningful real-world impacts? Can any such 'pathways to impact' be identified, described, and/or categorized?

6 – What 'facilitating factors' have supported research while traveling these 'pathways to impact'? Can we identify, describe, categorize practical 'principles' for scaling impact?

**Research stream three - *Research Quality Plus***

*Stream-specific objective:* ***How might research funders evaluate research quality with KT in mind?***

7 – Can a conceptual model of 'high quality research' that embraces KT be embedded in a research evaluation framework? If so, what can be learned from its implementation?

**4. Roadmap**

Following this introduction to the research rationale, structure, objectives, and questions, chapter 2 provides an overview of the study design and research methods. Included is an outline of research ethics review and approval and processes.

Chapters 3 and 4 present the *Funders' KT* research stream results. Chapter 3 presents a study protocol for an evaluation of the Canadian Institutes of Health Research KT Funding Program. This chapter was published in *Implementation Science* and laid the footing for the entire PhD research project. Chapter 4 provides the results of an international scan of 26 research funding agencies efforts to support KT. Published in *Health Research Policy and Systems*, this global overview adds valuable breadth and context to the remainder of the work.

Chapters 5 and 6 present results of the *Scaling Science* research stream. Chapter 5 provides a summary account of stream two rationale, methods, findings and implications. For a comprehensive account, readers should consult the central stream publication: *Scaling Impact: Innovation for the Public* Good which is published as a book by *Routledge* (McLean & Gargani 2019). Chapter 6 provides an important illustration of the KT focus of this PhD research. *The Scaling Playbook* introduces an action-oriented and evidence-based guide for researchers wanting to incorporate scaling into their projects from the outset. It is an illustration of the diversity of non-traditional outputs this PhD has generated.

Chapters 7 and 8 turn to the *Research Quality Plus*, or *RQ+*, research stream of this dissertation. Chapter 8 presents a manuscript published in *Research Evaluation* which outlines the rationale, framework, implementation, and meta-analysis results of the RQ+ approach at the International Development Research Centre. Chapter 8 illustrates how I have attempted to make my research accessible to those who might benefit from it – a practical application of the KT efforts described in this dissertation. It presents an academic commentary/perspective article invited for publication in one of the leading international science journals, *Nature*. The chapter outlines key results and possibilities for RQ+ as a ready and replicable evaluation tool.

The dissertation concludes with two closely linked chapters. Chapter 9 presents an integrated discussion. The aim is to recap the key contributions of each chapter, but concurrently, to showcase how the combination of the individual parts provides a higher-level set of implications for knowledge, practice, and policy. Finally, chapter 10 offers conclusions and recommendations. The advice touches on research directions, evaluation practice, and research funder policy. The objective is to build a more effective and evidence-informed approach for funder support to KT and scaling science.

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# PART II

# METHODS

**Chapter 2 –**

# *Study design and research methods*

**Summary**

This chapter provides an overview of the study design and methods used in the dissertation. Given the dissertation has been prepared as a compilation of publications a full discussion of specific methods – including sampling strategies and results, data collection approaches, analysis/synthesis techniques, ethics, and perceived limitations – is provided on a chapter-by-chapter basis.

## 1. Study Design

### 1.1. Epistemological stance

Overall, the research followed a pragmatic approach, making use of deductive and inductive methods to address the identified research questions. To do so, the research applied a subjectivist and constructivist stance while collecting data, interpreting their meaning, and reporting key findings and implications. This epistemological stance was selected to match the practical and dynamic knowledge needs of the primary intended research-users: research funders. The pragmatic approach, including embedding subjectivist and constructivist considerations is documented in the literature as good practice for use-oriented research of this nature (Kaushik & Walsh 2019; Creswell & Clark 2017). I reflect on the key drivers, strengths, and limitations of the epistemological stance in two places in this dissertation. At the outset, within the positionality statement embedded in chapter 1, and then with a retrospective lens, in the integrated discussion provided in chapter 9. I believe it is particularly important to note how the epistemological stance facilitated the knowledge translation component of the dissertation. As some of this dissertation (chapters 3, 4, 5, 7) was first conceptualized as program evaluation, it was important to focus on relevance and actionability of results. The evaluation aspects were further inspired by Patton's concept of Utilization Focused Evaluation (Patton 2008).

### 1.2. Multi-stream design

This dissertation comprises three interconnected research streams (*Funders' KT, Scaling Science, Research Quality Plus*). The results of each research stream are presented in the following chapters of the dissertation; each stream is represented in two distinct chapters.

A multi-stream design was employed to target specific knowledge and practice gaps. Partitioning the dissertation in this way allowed for a more focused and appropriately tailored implementation of research methods and a more compelling communication of results. This multi-stream design strengthened both the independent and the composite results. The guiding research objectives and questions of each research stream are outlined in chapter 1 of this dissertation.

The research was partitioned into three streams to optimize the specificity of data collection, analysis, and the communication to the intended user of each stream. However, the multi-steam design also benefitted the dissertation as a whole. The combination of research methods (see table 1 below, for an overview) gave rise to a rich, multi-method, multi-source, and global review of the state of knowledge translation and scaling practice and policy across a large sample of research funding agencies. How the results of each research stream interconnect is illustrated in the integrated discussion of chapter 9.

### 1.3. An Integrated Knowledge Translation approach

Each of the *Funders' KT*, *Scaling Science* and *RQ+* streams of the dissertation were implemented using a 'co-production' approach, whereby the researcher included and interacted with research-users through the research process. This approach is derived from the principles of Integrated Knowledge Translation (IKT) as described by Graham, Kothari and colleagues as a method of co-creating knowledge with those who will use it (Graham et al. 2014; Kothari et al. 2017; Graham et al. 2018). What makes IKT unique is its origin. It was developed by the Canadian Health Services Research Foundation and later popularized by its application at the Canadian Institutes of Health Research (Nguyen et al. 2020).

In this dissertation, the identified 'research-user' who is 'engaged' via the IKT approach is the research funding agency. To do so, each stream engaged an appropriately positioned funder for the corresponding component of the work. Indeed, these users were engaged in co-creating the stream-specific objectives and questions. For the *Funders' KT* stream, the engaged user was the Canadian Institutes of Health Research. For the *Scaling Science* and *RQ+* streams, the engaged user was the International Development Research Centre. Both organizations are Canadian-based and both hold notable interest in KT in the health sciences. The forthcoming chapters present the idiosyncrasies of IKT in each research stream and corresponding publication.

It is important to note that the results of the dissertation are intended to be beneficial beyond these immediate research-users, and accordingly, have been positioned for uptake and use by research funders writ large.

## 2. Research methods

Table 1 provides a high-level summary of the research methods employed across the multi-stream study design. In keeping with the Stellenbosch University guidelines for dissertations-by-publication, the methods are fully discussed in the chapter in which they are implemented. The purpose here is to present an overview of the full body of methodological effort. In compilation, Table 1 provides a snapshot of the multiple data collection, analysis, and research translation techniques employed over the course of the dissertation.

**TABLE 1** Summary of methods by dissertation chapter

| **Research stream 1 – *Funders' KT***<br>**Stream objective:** How do research funders support KT? | |
|---|---|
| ***Chapter*** | ***Survey of methods*** |
| 3. *Understanding the performance and impact of public knowledge translation funding interventions: Protocol for an evaluation of Canadian Institutes of Health Research knowledge translation funding programs* | As a study protocol, chapter 3 of the dissertation presents the design of a comprehensive evaluation of the Canadian Institutes of Health Research (CIHR) KT funding program. This includes secondary document reviews, primary qualitative interviews, a national on-line survey, in-depth case studies, and an international organizational scan. The complete evaluation was conducted in an Integrated Knowledge Translation approach and inspired by the principles of Utilization Focused Evaluation. The entire evaluation results are published as a public CIHR report (McLean & Tucker 2013) and are not incorporated into this dissertation. |
| 4. *Translating research into action: An international study of the role of research funders* | Methods comprised web-site review, document review and key informant interviews to investigate knowledge translation at 26 research funding agencies. The sample is international in scope, and includes a diverse range of funder types, including biomedical, clinical, multi-health domain, philanthropic, public and private organisations. The data builds on a 2008 study by the authors with the same international sample, which permitted longitudinal quantitative and qualitative trend analysis. Results were analysed against the purpose-built IRE framework (intended, realized, emergent). |

| **Research stream 2 – *Scaling Science***<br>**Stream objective:** What strategies might optimize funders' support for KT and impact? | |
|---|---|
| ***Chapter*** | ***Survey of methods*** |
| 5. *Scaling Science: Advancing Innovation for the Public Good* | From start to finish the *Scaling Science* stream employed an IKT approach that involved research-users in study framing, data collection, interpretation, and reporting. The engaged research-user was the International Development Research Centre. The study design comprised three phases. Phase one involved an environmental scan, which included academic and grey literature review, and qualitative interviews with research-users at IDRC and other funding agencies. The second phase initiated empirical data collection to respond to co-identified research |

| | |
|---|---|
| | questions and included inductive multi-project review (n=200) and deductive case study analysis (n=5). The case study line of inquiry included document review, in-depth interviews, and 2 site visits. Phase three involved an engaged approach to planning results reporting. |
| 6. *The Scaling Playbook: A Practical Guide for Researchers* | Chapter 6 presents a practical tool to help researchers embed the findings of the *Scaling Science* research stream into their work. The knowledge translation approach involved research-user involvement in iterative sense-making sessions to develop an initial draft guidebook, two piloting workshops (Dar es Salaam & Kigali) with multiple implementation research teams specializing in maternal and child health, and the development of two illustrative case-studies with qualitative interviews (n=8) and document review. To facilitate KT I stewarded the final result through use-oriented graphic design, user-testing, and subsequent translation of the final draft into French and Spanish. |

| **Research stream 3 – *Research Quality Plus***<br>**Stream objective:** How might research funders evaluate research quality with KT in mind? | |
|---|---|
| ***Chapter*** | ***Survey of methods*** |
| 7. *Making a difference in the real world? A meta-analysis of the quality of use-oriented research using the Research Quality Plus (RQ+) approach* | To introduce, implement, and validate the Research Quality Plus approach, chapter 7 provides a meta-analysis of research supported by IDRC. The chapter presents a literature review which positions the RQ+ approach against major know-how gaps. It then provides a walk-through of the RQ+ framework, and its first application in 7 independent evaluation studies. Together the evaluations draw-together a dataset that comprises 170 research studies, spanning multiple disciplines of the social and natural sciences and was conducted across the globe. Finally, the chapter uses statistical techniques to analyze the aggregate dataset in a meta-analysis. |
| 8. *A better measure of research from the Global South* | Chapter 9 provides a commentary/perspective designed to showcase the *RQ+* research stream and its potential value to research and science systems globally. As such it represents a KT method of communicating study results to broader audiences. Although not discussed in the publication, the preparation of the chapter involved a defence of the RQ+ approach and meta-analysis results with the editorial board of the journal publishing the commentary, *Nature*. To do this, I presented an in-person lecture to the editorial team at *Nature* and presided over a subsequent oral discussion and debate. |

**3. Research ethics**

Given the multi-stream study design, research ethics approvals were granted by several authorities and at appropriate points in time for the work under review. The Ottawa Health Science Network Research Ethics Board provided approval for the CIHR KT evaluation. The Stellenbosch University Health Research Ethics Committee approved the follow-up international scan and empirical data collection with external research funders. In addition, the International Development Research Centre provided approval for the *Scaling Science* and *Research Quality Plus* streams in respect to its adherence to the Government of Canada's *Directive on Results* and the Canadian *Financial Administration Act.* This Canadian Federal Government legislation grants the funding agency authority to approve organizational evaluation research, inclusive of primary and secondary data collection, analysis, retention, and reporting. Research stream two and three were governed by this ethical oversight regime.

Through the course of the project – including all interactions with human participants – there were no identified instances of real or perceived threats to ethical conduct that arose. This was true for the stipulations of each of the ethics governing bodies: the Ottawa Health Science Network Research Ethics Board, Stellenbosch University's Health Research Ethics Committee, and the IDRC approval vis-a-vis the Government of Canada's federal *Directive on Results*. Accordingly, no violations or remedies were filed in the course of the project.

**4. Funding**

To uphold good publishing practice, funding support for the specific components of this dissertation-by-publication are declared within each publication.

The tuition, travel, and general study costs of the PhD project were self-funded. Since 2018, I have benefitted from a Fellowship with the CIHR Integrated Knowledge Translation Research Network (IKTRN) at the Ottawa Hospital Research Institute/University of Ottawa.

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# PART III

## FINDINGS

# RESEARCH STREAM ONE

# *Funders' KT*

### *Context*

Research can lead to improved health outcomes. However, translating research into meaningful improvement in peoples' lives requires much more than knowledge creation.

The *Funders' KT* research stream aimed to investigate the role that public research funders play in supporting the conversion of research into action. It begins with a deep dive into the theory and practice of KT at Canada's national health research funder, the Canadian Institutes of Health Research. To contrast and expand this case-study analysis, the research stream provides an international and longitudinal analysis of 26 funders from around the world. This research stream fills a critical knowledge gap and builds an evidence-base for practice and policy in funder KT.

### *Stream objective*

How do research funders support KT?

### *Stream research questions*

1. What roles do research funders currently play in the KT processes of the research they support?
2. Which roles have been evaluated? If evaluations exist, what can be deduced about the efficacy of KT support activities?
3. Does the synthesis of primary data collected across funders, or funders programs/activities, provide new or higher quality knowledge about common or divergent practice and successful or unsuccessful practice?
4. Can any trends in funder support for KT be identified?

**Chapter 3 –**

# *Understanding the performance and impact of public knowledge translation funding interventions: Protocol for an evaluation of Canadian Institutes of Health Research knowledge translation funding programs*

**SUMMARY**

This chapter lays out the study protocol for a multi-component, mixed methods evaluation of the Canadian Institutes of Health Research (CIHR) Knowledge Translation (KT) funding program. This peer-reviewed publication forms the foundation for the complete dissertation and its investigation of the role of research funders in KT. It presents an overview of KT practice of a national research funder, a replicable protocol for funder-led KT evaluation, and an original 'theory of change' for KT programming. Having been co-produced with an IKT approach, the paper provides rich perspective and narrative on how CIHR supports KT. The corresponding evaluation was conducted and is available in open access. The evaluation report is not included in the dissertation as the findings are framed directly for CIHR, not the broader funder community or academy. This novel evaluation protocol is included, as it provides a reproducible roadmap that funders might use to contribute to the central dissertation objective from their own context: *how can funders support KT?*

**Role of the PhD candidate:** As first author of the paper, I led the design of the study protocol, wrote the first draft of the manuscript, facilitated/elicited contributions of all co-authors, edited and revised the final manuscript and managed journal submission for publication in *Implementation Science*. During the evaluation project I was lead evaluator, and chair of the Evaluation Working Group.

**Reference:** McLean RKD, Graham ID, Bosompra K, et al. Understanding the performance and impact of public knowledge translation funding interventions: Protocol for an evaluation of Canadian Institutes of Health Research knowledge translation funding programs. *Implementation Sci.* 2012;7(57). doi:10.1186/1748-5908-7-57.

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IMPLEMENTATION SCIENCE

STUDY PROTOCOL Open Access

# Understanding the performance and impact of public knowledge translation funding interventions: Protocol for an evaluation of Canadian Institutes of Health Research knowledge translation funding programs

Robert K D McLean[1*], Ian D Graham[2,3], Kwadwo Bosompra[1], Yumna Choudhry[2], Stephanie E Coen[4], Martha MacLeod[5], Christopher Manuel[1], Ryan McCarthy[2], Adrian Mota[2], David Peckham[1], Jacqueline M Tetroe[2] and Joanne Tucker[1]

## Abstract

**Background:** The Canadian Institutes of Health Research (CIHR) has defined knowledge translation (KT) as a dynamic and iterative process that includes the synthesis, dissemination, exchange, and ethically-sound application of knowledge to improve the health of Canadians, provide more effective health services and products, and strengthen the healthcare system. CIHR, the national health research funding agency in Canada, has undertaken to advance this concept through direct research funding opportunities in KT. Because CIHR is recognized within Canada and internationally for leading and funding the advancement of KT science and practice, it is essential and timely to evaluate this intervention, and specifically, these funding opportunities.

**Design:** The study will employ a novel method of participatory, utilization-focused evaluation inspired by the principles of integrated KT. It will use a mixed methods approach, drawing on both quantitative and qualitative data, and will elicit participation from CIHR funded researchers, knowledge users, KT experts, as well as other health research funding agencies. Lines of inquiry will include an international environmental scan, document/data reviews, in-depth interviews, targeted surveys, case studies, and an expert review panel. The study will investigate how efficiently and effectively the CIHR model of KT funding programs operates, what immediate outcomes these funding mechanisms have produced, and what impact these programs have had on the broader state of health research, health research uptake, and health improvement.

**Discussion:** The protocol and results of this evaluation will be of interest to those engaged in the theory, practice, and evaluation of KT. The dissemination of the study protocol and results to both practitioners and theorists will help to fill a gap in knowledge in three areas: the role of a public research funding agency in facilitating KT, the outcomes and impacts KT funding interventions, and how KT can best be evaluated.

* Correspondence: robert.mclean@cihr-irsc.gc.ca
[1]Evaluation Unit, Canadian Institutes of Health Research, 160 Elgin Street, Ottawa, ON, Canada
Full list of author information is available at the end of the article

## Background

Around the world and across the spectrum of scientific and non-scientific goods and services, there is a desire for service and product provision to be informed by evidence. This desire has been made explicit within the realm of health research through the concept and ideal of evidence-based practice. However, the fact remains that health practice often lags behind knowledge and best practices established through health research [1,2]. To address this issue, efforts have been made to promote evidence-based practice and the use of research in practice. This is a concept that has become known by many names, including knowledge translation (KT) [3,4].

At the Canadian Institutes of Health Research (CIHR), Canada's national health research funding agency, KT is defined as a dynamic and iterative process that includes synthesis, dissemination, exchange, and ethically-sound application of knowledge to improve the health of Canadians, provide more effective health services and products, and strengthen the healthcare system [5]. In more simple terms, KT at CIHR is about having research act as a driver of appropriate real-world applications. KT has been an important aspect of CIHR's vision and work since the organization's inception in 2000. In fact, to formalize the importance of KT to the organization, it was embedded in the CIHR mandate and written into the Parliamentary act that created CIHR as it now exists [6]. What this means in practice is that CIHR has written KT into its strategic plan, with a directive to accelerate the capture of the benefits of health research; created executive management roles and a unique branch of the organization devoted expressly to KT; and developed KT-specific funding mechanisms—the focus of the present evaluation protocol. The range of CIHR's strategic activities and funding opportunities to address KT are designed to support not only KT science but also all of the elements of CIHR's definition of KT (synthesis, dissemination, exchange, and ethically sound application of knowledge).

Paradoxically, and we believe to its disadvantage, the field of KT has lagged in what it is designed to address—the use of evidence to inform better products, services, and systems. Despite the fact that much evidence exists to support the need for KT, very little evidence exists that measures the performance and impact of KT interventions, especially when those interventions are funding mechanisms [4,7].

The evaluation research described in this protocol is designed to address this shortcoming of concern to practitioners and theorists alike. The aim of this study protocol, and the dissemination of its subsequent results, is to generate evidence in relation to the role of a public research funding agency in enabling/promoting KT, the outcomes and impacts of KT funding interventions, and how KT can best be evaluated. The study will investigate how efficiently and effectively the CIHR model of KT funding programs operates, what immediate outcomes these funding mechanisms have produced, and what impact these programs have had on the broader state of health research, health research uptake, and health improvement. The need for further research on the effectiveness of KT is especially imminent for the public funding agency, where KT interventions are designed to benefit the whole of society and are financed to do so by the taxpayer.

As very little evaluation has been conducted on the performance and promotion of KT, the study described in this protocol represents a unique approach to this complex task. The approach is grounded in the theoretical frameworks of both evaluation and KT. The remainder of the protocol presents an overview of this undertaking. The section that follows describes the approach to scoping an evaluation of CIHR KT interventions. The remaining sections outline the study methodology and provide a discussion of potential study implications.

## Scoping the study

### Evaluation purpose

Primarily, this evaluation study is designed to provide valid and insightful findings about the performance of CIHR's KT programs for the purposes of program learning and future KT program development. The study will investigate how efficiently and effectively the CIHR KT funding programs operate, what immediate outcomes these funding mechanisms have produced, and what impact these programs have had on the broader state of health research, health research uptake, and health improvement.

The evaluation is also designed to meet CIHR's requirements to Canada's Treasury Board Secretariat (TBS) in order to demonstrate value for money in government spending. It therefore covers specific core TBS evaluation issues of program relevance and performance as described in the TBS policy suite [a]. In the discussion section, we elaborate on the implications of designing the evaluation protocol to meet both our prospective program learning and development objectives, and retrospective accountability and reporting objectives.

The CIHR Act (Bill C-13) mandates CIHR to ensure that the translation of health knowledge permeates every aspect of its work [6]. An evaluation of all knowledge translation programs and activities at CIHR would therefore need to be broad in scope, be extremely resource intensive, and as such would likely only be able to provide very high-level findings. The intent of this evaluation is to provide evidence about the performance of CIHR's overall KT strategy, but also to provide more detailed findings about the intricate factors surrounding

the design and delivery of this strategy (*i.e.*, the targeted funding opportunities). Accordingly, the study outlined in this protocol is designed to address some of the key constraints and limitations of evaluating KT at CIHR including:

1. Ensuring that the evaluation is sufficiently targeted to investigate the idiosyncratic factors surrounding individual KT funding opportunities;
2. Ensuring the evaluation gathers data that reflect the operational definition of KT at CIHR (synthesis, dissemination, and ethically sound application of knowledge);
3. Ensuring that the evaluation is designed to gather data required by the Treasury Board while also collecting data that will address our objectives related to program learning and development;
4. Performing such research with a limited set of resources (particularly, time and financial constraints).

To address these considerations, a purposive sampling approach to selecting a set of KT funding programs was developed. Focusing on a comprehensive sample of funding programs enables the evaluation to provide detailed, precise, and useful findings at the program level. Triangulated and rolled-up, this data will provide an indication of the overall performance of CIHR's KT strategy. Five CIHR KT funding domains were selected to be within the scope of this evaluation:

1. Knowledge Synthesis funding opportunity;
2. Partnerships for Health Systems Improvement (PHSI) funding opportunity;
3. Knowledge to Action (K2A) funding opportunity;
4. End of grant KT funding opportunities (Dissemination Events (DE) and the KT Supplement (KTS) programs)[b];
5. KT research funding opportunity[c].

These programs were selected and validated for inclusion based on two key criteria—program relevance and program materiality

### Program relevance

Programs were selected in order to provide full theoretical coverage of the four fundamental KT themes identified by CIHR management as representative of the purpose and concept of KT at CIHR. Details of these are provided in Table 1. The relevance review of KT programs was conducted through formal consultation with CIHR senior management and KT specific staff, and validated by external expert opinion [d].

**Table 1 Relevance and materiality coverage of selected KT funding programs**

| Selected funding program | KT area of focus | CAD(mil) - 2010-11 financial commitment | % of 2010-11 KT financial commitment |
|---|---|---|---|
| Knowledge Synthesis | Synthesis; Integrated KT | 1.76m CAD | 10.6% |
| Partnerships for Health System Improvement | Integrated KT | 6.29m CAD | 37.7% |
| Knowledge to Action | Integrated KT | 1.33m CAD | 8% |
| DE and KTS | End grant KT | 1.34m CAD | 8% |
| KT research | KT science | n/a | n/a |
| **Total coverage** | | **10.72m CAD** | **64.3%** |

**Notes: 1)** Figures are based on finance coding for CIHR's PAA 1.4.2.; **2)** KT research financial data is not included for the current period as money is not moved directly through PAA 1.4.2.; **3)** Programs not included in our evaluation as a whole represent 35.7% of PAA area spending (less Partnerships programs that were purposely removed) and for this period are: Reduce Health Disparities, Training Awards, CADRE, Clinical Research Initiatives, Health Research Community Awards, KT Awards, Mobility in Aging, Cochrane Canada, Youth and Public Engagement, Res Action Program in Dementia, Partnerships award, JBI, Journalism Awards, Evidence Review and Synthesis Centre, Canadian Knowledge Synthesis Network, Canadian Virtual Library Network.

### Program materiality

CIHR financial records were reviewed to assess the materiality of each KT program, and a risk-based approach to selecting programs was applied. The five selected domains represent approximately 65% of current financial commitments for the KT area at CIHR [e,f]. Excluding the KT research funding opportunity within the open operating grants program (OOGP), the four programs also represent the four largest individual financial commitments provided through KT funding at CIHR.

## KT at CIHR and specific KT funding programs being examined

In this section, contextual details are provided on the concept of knowledge translation and the strategic approach to KT at CIHR. Subsequently, a description is provided of the funding programs that will be specifically examined through the evaluation study.

Figure 1 is a logic model [g] that was produced as a part of the planning of this evaluation. It provides a visual representation of the object of the evaluation.

### The concept of knowledge translation at CIHR

To promote/enable the concept of KT as defined by CIHR, there are four aspects supported by the organization: knowledge synthesis, integrated KT, end of grant KT, and KT science.

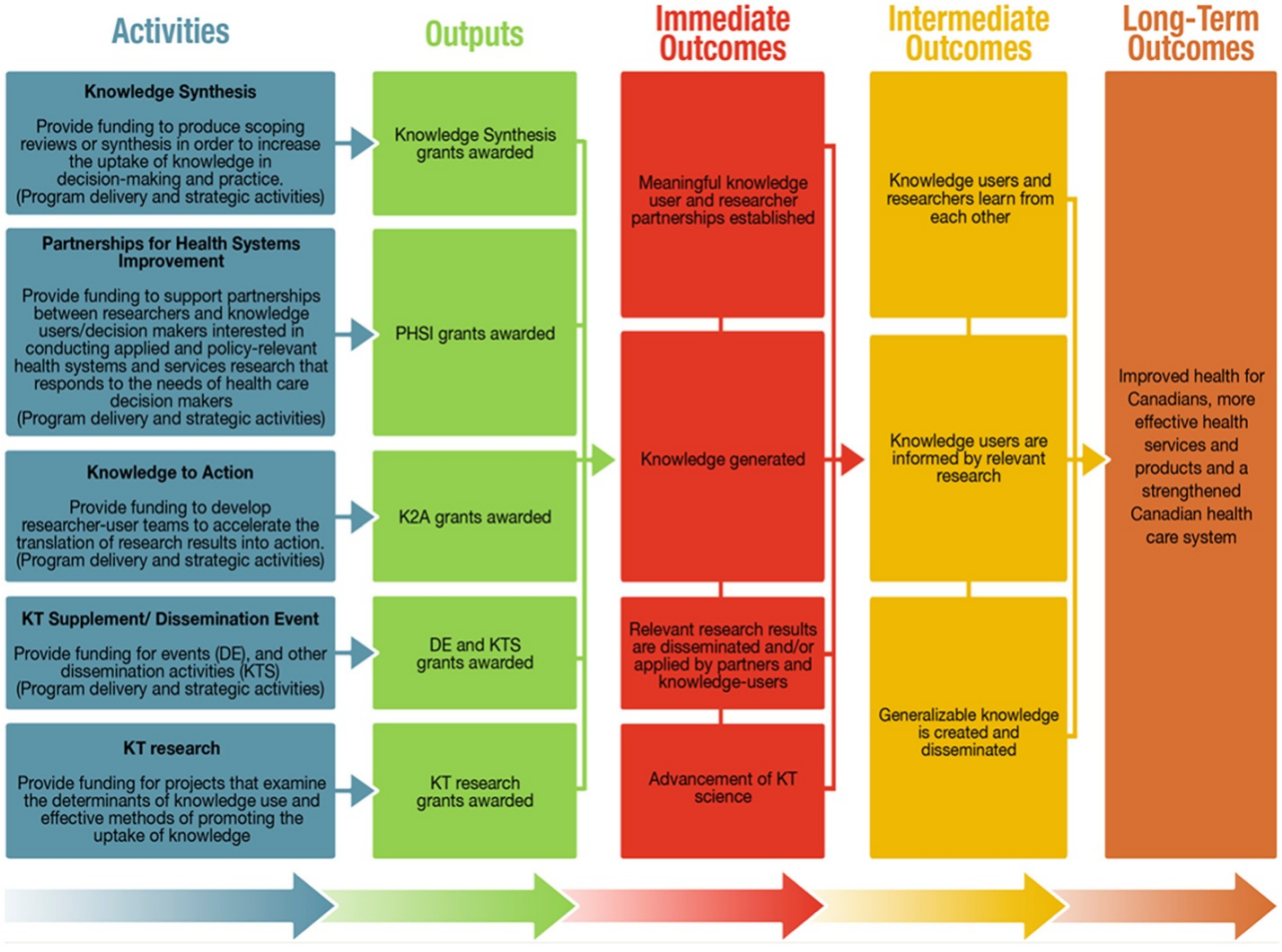


**Figure 1** Knowledge translation funding programs logic model.

Synthesis is the contextualization and integration of research findings of individual research studies within the larger body of knowledge on the topic. It is a family of methodologies developed to determine what is known in a given area or field and what the knowledge gaps are. The underlying principle is the support of timely and accurate scientific knowledge being available to those who work in real-world settings requiring such evidence. Knowledge synthesis studies may be useful to policy-makers, industry, clinical, and medical practitioners, amongst others. In some cases, knowledge synthesis research can be conducted with the participation of non-traditional researchers throughout the research process. CIHR refers to the engagement of knowledge users in research as integrated KT (iKT).

Through iKT, stakeholders or potential knowledge users are engaged in the entire research process. By doing iKT, researchers and knowledge users work together to shape the research process by collaborating to determine the research questions, deciding on the methodology, being involved in data collection and tools development, interpreting the findings, and helping disseminate the research results. This approach is designed to produce research findings that are more likely to be relevant to and used by end users. This approach is similar to those described as collaborative research, participatory, action-oriented research, co-production of knowledge, and Mode 2 knowledge production.

End of grant KT describes the process where the researcher develops and implements a plan for making knowledge users aware of the knowledge that was gained during a project. End of grant KT includes the typical dissemination and communication activities undertaken by most researchers, such as KT to their peers through conference presentations and publications in peer-reviewed journals. End of grant KT can also involve more intensive dissemination activities that tailor the

message and medium to a specific audience, such as summary briefings to stakeholders, interactive educational sessions with patients, practitioners, and/or policy makers, media engagement, or the use of knowledge brokers to name a few. The commercialization of scientific discoveries is another form of end of grant KT, but as a specific strategy it is not being explored in this study.

KT science or research (also known as implementation science) is the study of the process of KT and the use of knowledge. KT science explores the factors that facilitate and hinder the sharing of knowledge between creators and users. While it often addresses issues such as the efficacy of certain KT strategies, KT science may also involve the development of new KT theory or practice.

### Specific KT funding programs

#### Knowledge synthesis funding opportunity

Knowledge synthesis grants provide funding to researchers to produce scoping reviews or syntheses that meet the needs of decision makers or knowledge users in all areas of health. They support the concept that knowledge users should identify synthesis questions in collaboration with researchers so that the answers to these questions can inform policy, programs, and practice. They are also expected to increase the capacity of researchers to identify new, relevant avenues for exploration that have not yet been investigated that respond to decision makers' and knowledge users' needs [8]. Finally, because they are funded to be performed in an iKT format, synthesis grants are intended to promote the process of mutual learning between researchers and knowledge users.

First launched in 2004, CIHR invites all forms of knowledge synthesis. Qualitative, quantitative, and mixed methods approaches are accepted, as well as syntheses of knowledge gained through observation, testing, or reviewing of texts. Scoping reviews are also eligible; these are projects that explore the literature available on a topic, identifying the key concepts, theories, sources of evidence, and gaps in the research. They are often undertaken before a full synthesis when the literature is thought to be too vast or when there is suspicion that not enough literature exists to synthesize [8]. Because the knowledge synthesis funding opportunity is funded as iKT, applications to the funding opportunity undergo a merit review process.

Merit review is markedly different than typical CIHR peer review. The composition of iKT research teams and/or the nature of KT research projects require that merit review panels expand the traditional definition of 'peer' to include knowledge users whose expertise lies in the application of research. Because both researchers and knowledge users contribute to the production and the translation of research, merit review panel composition must reflect this, drawing members from both researcher and knowledge user communities. Each application is reviewed by at least one researcher and at least one knowledge user who assess potential impact and scientific merit; potential impact and scientific merit are weighted equally. Only those applications receiving a fundable score on both potential impact and scientific merit can be considered for CIHR funding [9].

#### Resources

Knowledge synthesis competitions are launched twice a year by the CIHR Knowledge Translation Branch in partnership with various CIHR institutes and strategic initiatives, along with external partners. The maximum amount awarded for a synthesis is 100,000 CAD for one year. The maximum amount awarded for scoping reviews is 50,000 CAD for one year.

#### Partnerships for health system improvement (PHSI) funding opportunity

The first CIHR PHSI competition was held in 2005 after it was transferred from Canadian Health Services Research Foundation. The PHSI funding program supports teams of researchers and decision makers/knowledge users interested in conducting applied and policy-relevant health systems and services research that respond to the needs of healthcare decision makers. Partnerships can be project specific (partners that the researchers identify themselves) or competition specific (CIHR negotiated competition partnerships). This funding opportunity requires pre-defined financial or in kind partner contributions [10]. PHSI grants are funded to be performed in an iKT format, and as such, this program uses a merit review process to evaluate applications.

#### Resources

The maximum amount awarded by CIHR for a single grant is 400,000 CAD for up to three years (partnership contributions are in addition to the CIHR amount). A minimum of either 20% or 30%, depending on the province or territory, of the grant budget must come from external partner sources (*i.e.*, non-CIHR funds). There is no limit to partner contributions, and in-kind contributions are recognized, especially where they reflect meaningful collaboration that will increase the likely success of the project. It should be noted that funding and contributions may be received from stakeholders who are not members of the grant team.

#### Knowledge to action (K2A) funding opportunity

K2A is designed to move knowledge into action by linking researchers and knowledge users and to increase the understanding of knowledge application through the

process. By bringing both parties together, it is expected that research results will translate to actions that strengthen Canada's healthcare system and/or improve the health of Canadians. K2A also aims to support the development, implementation, and evaluation of cutting-edge KT research and approaches. Through this, the program establishes and strengthens common ground between the interests and expertise of the research community and the needs of knowledge users. Applicants can request funding to support partnerships, knowledge, and tools for implementation projects. This program was first launched in 2005. Because the K2A funding opportunity requires iKT, all applications go through a merit (not peer) review process.

#### Resources

The maximum CIHR contribution is 100,000 CAD per year for up to two years. Applicants may increase funding for their proposal and further demonstrate the level of engagement of their partner(s) through cash or in-kind commitments, but a financial commitment from the partner is not a criterion for funding [11]. Applicants are encouraged to apply for a renewal of their grant if they plan to scale up their implementation project.

### End of grant KT funding opportunities: Dissemination events (DE) and the KT supplement (KTS)

The DE and KTS funding opportunities both support end of grant KT. DE is intended to provide support for meetings, and/or dissemination activities consistent with the mandate of CIHR and relevant CIHR institutes, initiatives, or branches. It supports the organization of events focused on the communication of health research evidence. The KT Supplement funding opportunity supports KT activities that follow implementation of a peer-reviewed grant/award where further dissemination is appropriate. Both DE and KTS applications undergo a peer review, rather than merit review, process.

Eligible activities for the DE funding opportunity include:

1. Education of groups such as patients, health professionals, community organizations, policy-makers, the general public;
2. Education of stakeholders regarding partnership best practices;
3. Knowledge dissemination that will inform practice, clinical care, policy and decision making;
4. Publishing articles in open access journals not budgeted for in other applications, as part of a broader dissemination strategy.

Eligible activities for the KTS funding opportunity include:

1. Development/maintenance/updating of websites;
2. Production and distribution of written materials in various formats;
3. Hiring of a knowledge broker or implementation facilitator/change agent;
4. Development of plain language summaries;
5. Development of knowledge exchange tools (*e.g.*, educational DVDs, decision support tools);
6. Dissemination of research results through specialized publications as part of a broader KT strategy, and;
7. Travel costs for a series of meetings/presentations (linkage and exchange activities) required to implement a broader KT strategy.

#### Resources

These end of grant KT funding opportunities are non-renewable one-year grants. However, multiple grants can be awarded to the same candidate in the same calendar year. DE projects are funded up to 25,000 CAD, while KTS projects are funded up to 100,000 CAD [12].

### KT research funding opportunity within the OOGP

Funded KT research grants must be directed toward developing theory, evidence, and innovation to define the determinants, implementation, and uptake of health research evidence into practice. These include grants that aim to improve KT to consumers, health practitioners, and policy makers, to examine the role of organizations as KT vehicles, to determine how to improve knowledge uptake potential during the research process, to develop/evaluate KT tools and/or methods, and to contribute to KT theory and to improve knowledge uptake. KT research grants do not require knowledge user partners, although they are allowed, and are peer (not merit) reviewed.

#### Resources

These OOGP competitions provide funding for up to five years and have no funding limit or specific requirements for team size or composition. Funding is allocated through the CIHR open operating grant budget rather than CIHR's KT-specific budget. The Knowledge Translation Research committee is one of 53 standing committees on the OOGP.

## Methods

The following section outlines the investigation process that will be employed in this research. Each method of inquiry is described, and a brief preface about the process of design is included.

### Design and process

The study will employ a novel method of participatory, utilization-focused evaluation inspired by the notion of iKT. The study will use a mixed methods approach, drawing on both quantitative and qualitative data, and will elicit participation from stakeholder groups, including CIHR funded researchers, knowledge users, KT experts, TBS, and other health research funding agencies. The use of a mixed methods approach will be beneficial to uncovering significant detail about this complex intervention [13].

Utilization-focused evaluation is based on the idea that evaluations are only as efficacious as they are useful to their consumer(s). Patton [14] describes utilization-focused evaluation as being established on the premise that evaluations should be judged based on their actual use, and therefore, from planning to conclusion they should be conducted in the manner that is best adapted for intended end users. To us, stakeholders are much more likely to use this evaluation if they feel ownership over the evaluation purpose, process, and findings. By actively involving users throughout this evaluation, the foothold for use is being established and the utility of the evaluation is being continuously reinforced.

To realize this utilization approach, we have designed the protocol through a collaborative approach between multiple stakeholders, assembled in a research team that we have called the Evaluation Working Group. The Evaluation Working Group is chaired by CIHR's Evaluation Unit, and included a broad spectrum of CIHR staff involved in developing, delivering, and evaluating the programs; these members represented key internal KT stakeholders with operational knowledge of KT program design and delivery (representing the KT Branch as well as a CIHR institute). The Evaluation Working Group also included an external (non-CIHR employed) researcher with KT expertise and funding who also serves as the chair of one of the merit review panels of interest. The combination of CIHR internal and external perspectives on the Evaluation Working Group ensured that the protocol development was grounded in the operational realities of CIHR and designed to provide appropriate input for program improvement purposes, while being attuned to practicalities of engaging with these programs and implementing funded projects on the program user side. The intent is to conduct the evaluation in a participatory fashion similar to what CIHR expects of applicants to its iKT funding programs. The Evaluation Working Group members involved in the design phase will remain involved through the entire research process. Indeed, conducting this research in a collaborative fashion will facilitate the utility of the evaluation through both process and product (or findings) benefits, and, as such, support the use of the evaluation [15]. *Ad hoc* participation from each group member is to be expected and encouraged, however, at five critical stages the entire group will meet to seek consensus and affirm their satisfaction and that their representation is upheld:

1. The design of the evaluation framework—this includes the study sampling process (described above), the design of the logic model, the design of research questions, and the selection of methods.
2. At the data collection phase the team will review all instruments and processes and take part in collection where appropriate.
3. When data are collected, the team will review findings from individual perspectives and then meet to form a group consensus on final interpretation and to learn how others reflections complement or detract from their own.
4. After measured contemplation of the findings, the group will consult to discuss best methods of developing an action plan to implement evaluation recommendations.
5. After measured contemplation of the findings, the group will consult to discuss best methods of dissemination to stakeholders, both external and internal.

### Evaluation questions

The evaluation will be focused on addressing a set of overarching questions regarding CIHR KT strategy through investigating funding program performance. In order to maximize the utility of the evaluation, these questions were developed collaboratively with the Evaluation Working Group.

The questions provide the overall direction for the evaluation; a series of detailed indicators and data sources designed to address these has been developed.

The overall evaluation questions are as follows:

1. What role is there for CIHR in enabling/promoting iKT research, synthesis, end of grant KT, and KT science?
2. To what extent are KT funding programs achieving their expected outcomes?
3. What factors facilitate or inhibit the achievement of funding program outcomes?
4. How effective is the mix of KT funding programs in achieving CIHR's expected outcomes? (iKT, end of grant KT, KT science, synthesis)
5. To what extent have KT funding programs reached a broad and diverse range of knowledge users?
6. To what extent are KT funding programs being delivered as expected? Can any changes be made to program delivery in order to improve efficiency and effectiveness?

7. What would be the effect on CIHR-funded researchers and knowledge users if the KT program suite no longer existed? What would be the effect on the improvement of health, more effective health services and products, and the strengthening of the healthcare system?
8. What are the unanticipated outcomes, positive or negative, resulting from the KT funding programs?

The Evaluation Matrix in Table 2 provides full details of indicators and data sources

**Table 2 Evaluation Matrix**

| Evaluation questions | Indicators | Methods | Sources |
|---|---|---|---|
| 1. What role is there for CIHR in enabling/promoting synthesis, iKT, end-of-grant KT, and KT science? | | | |
| | • Theory and empirical evidence related to the role of a funding organization in the KT process | ■ International environmental scan | ■ 33 funding agencies from Tetroe *et al.* 2008 study |
| • Is the CIHR role consistent with the health needs of Canadians, the improvement of health products and services, and the strengthening of the Canadian healthcare system? | • Theory and empirical evidence related to the advantages and limitations of iKT research, end-of-grant KT, and KT science | | |
| | • Degree of alignment of CIHR KT funding program suite with theory and empirical evidence of KT success strategies | | |
| | • Organizational scan of comparable organizations nationally and internationally | | |
| | • Expert opinion on the role of a funding organization in the KT process | ■ External expert review | ■ International KT expert panel |
| | • Expert opinion on the CIHR funding program mix | | |
| | • Expert opinion on CIHR strengths, limitations, and strategic vision for KT funding programs | | |
| | • Indications of incentive induced behaviour of researchers and knowledge users | ■ Case studies | ■ Exceptional funded projects |
| | • Indications of unique or innovative KT strategies employed | | |
| | • Application pressure (total applications per funding program) | ■ Document and EIS data review | ■ EIS application records |
| | • Ratio of researchers funded *versus* applied | | ■ CIHR guiding documents |
| | • Ratio of researchers funded *versus* fundable but not funded | | ■ Government of |
| | • Degree of alignment with CIHR mandate and strategic vision | | ■ Canada documentation |
| | • Degree of alignment with the government of Canada's plans and priorities? (*i.e.* SandT Strategy) | | |
| 2.To what extent are KT funding programs achieving their expected outcomes? | • Indications of immediate, intermediate, and long-term outcomes | ■ Surveys | ■ Funded researchers/ knowledge users |
| • To what extent are immediate outcomes being achieved? | | | |
| • To what extent are intermediate outcomes being achieved? | | | |
| | | ■ Key informant interviews | ■ Funded researchers/ knowledge users |
| | | ■ Case studies | ■ Exceptional funded projects |
| | • The number of grants awarded by each program | ■ Document and EIS data review | ■ EIS application records |
| | • # of partnerships created (iKT) | | ■ End of grant reports |

**Table 2 Evaluation Matrix** *(Continued)*

| | | | |
|---|---|---|---|
| | • Comparison of application pressure across funding programs | | |
| | • Indications of intermediate and long term outcomes | | |
| | • Degree of alignment of KT funding progam suite with theory and empirical evidence of KT success strategies | ■ International environmental scan | ■ 33 funding agencies from Tetroe *et al.* 2008 study |
| | | ■ External expert review | ■ International KT expert panel |
| 3. What factors facilitate or inhibit the achievement of outcomes? | • Indication of influence on program theory from:: internal program processes; external environmental factors; strategic level factors; program delivery level factors | ■ Surveys | ■ Funded researchers/ knowledge users |
| | | ■ Key informant interviews | ■ Funded researchers/ knowledge users |
| | | ■ Case studies | ■ Exceptional funded KT projects |
| | | ■ Document and EIS data review | ■ EIS application records |
| | | | ■ Final reports |
| | • Program delivery level factors | | |
| 4. How effective is the mix of funding programs in achieving CIHR's expected outcomes? (iKT, End of grant-KT, KT Science, Synthesis) | • Perceptions of suitability of program mix for promoting/enabling effective KT | ■ Key informant interviews | ■ Funded researchers/ knowledgeusers |
| | | ■ Surveys | ■ Funded researchers/ knowledge users |
| | • Profiles of pathways to program outcomes | ■ Case studies | ■ Exceptional funded KT projects |
| | • Degree of alignment of CIHR KT funding program suite with theory and empirical evidence of KT success strategies | ■ External expert review | ■ International KT expert Panel |
| | | ■ International environmental scan | ■ 33 funding agencies from Tetroe *et al.* 2008 study |
| 5. To what extent have KT funding programs reached a broad and diverse range of knowledge users? | • Number and type of knowledge users included per iKT grant | ■ Document and EIS data review | ■ EIS application records |
| | | | ■ Final reports |
| | • Perceptions of meaningful partnerships having been established | ■ Surveys | ■ Funded researchers/ knowledge users |
| | | ■ Key informant interviews | ■ Funded researchers/ knowledge users |
| | | ■ Case studies | ■ Exceptional funded KT projects |
| 6. To what extent are KT funding programs being delivered as expected? Can any changes be made to program delivery in order to improve efficiency and effectiveness? | • Indications of efficiency and effectiveness in the conversion of program activities into program outputs | ■ Document and EIS data review | ■ EIS application records |
| | | ■ Surveys | ■ Funded researchers/ knowledge |
| | • Identified success and challenges of the merit review process | | ■ users |
| | | ■ Key informant interviews | ■ Funded researchers/ knowledge users |

**Table 2 Evaluation Matrix** *(Continued)*

| | | | |
|---|---|---|---|
| | | ■ Case studies | ■ Exceptional funded KT projects |
| 7. What would be the effect on CIHR-funded researchers and knowledge users if the KT funding program suite no longer existed? What would be the effect on the improvement of health, more effective health services and products, and the strengthening of the healthcare system? | • Perceived impact of absence of future KT funding on funded researchers, knowledge users, and KT outcomes | ■ Surveys | ■ Funded researchers/ knowledge users |
| | • Perceived future directions for funded researchers, knowledge users, and KT outcomes in the absence of KT funding | ■ Key informant interviews | ■ Funded researchers/ knowledge users |
| | • Use of alternative funding sources by KT funded teams (leveraging) | ■ Case studies | ■ Exceptional funded KT projects |
| | • Use of alternative funding sources by KT researchers and knowledge users not funded by CIHR (Knowledge User partners) | ■ EIS | ■ EIS application records |
| | • Organizational scan of similar organizations nationally and internationally | | ■ Final reports |
| | | ■ International environmental scan | ■ 33 funding agencies from Tetroe *et al.* 2008 study |
| 8. What are the unanticipated outcomes, positive or negative, resulting from the KT funding programs? | • Identified unintended outcomes of KT funding programs | ■ Document and EIS data review | ■ EIS application records |
| | | | ■ Final reports |
| | | ■ Surveys | ■ Funded researchers/ knowledge users |
| | | ■ Key informant interviews | ■ Funded researchers/ knowledge users |
| | | ■ Case studies | ■ Exceptional KT funded projects |
| | | ■ International | ■ 33 funding agencies |
| | | ■ environmental scan | ■ from Tetroe *et al.* 2008 study |
| | | ■ External expert review | ■ International KT expert panel |

Note: Indicators and sources presented in this matrix are not static. As the research process progresses, the Evaluation Working Group will be attuned to new information that may create the need for review

### Methods of investigation

To ensure that findings are robust and that valid conclusions can be drawn about the performance of the programs, the evaluation will use multiple methodologies and draw on both quantitative and qualitative evidence. A range of methods will be employed to capture a wide diversity of data, namely: an international environmental scan of health research funding agencies; a document review and CIHR's Electronic Information System (EIS) data review; in-depth key informant interviews; quantitative surveys; case studies; and an external expert panel discussion. A range of quantitative and qualitative data analysis techniques will be used to interpret each source of data, and are described under each heading below. To ensure rigour, our analysis will triangulate findings from all methods to inform study conclusions.

### International environmental scan

A review of organizations from a range of countries that provide KT research funding will be conducted in order to gather information regarding the how they fund KT and what might be considered best practices in the field. The environmental scan will focus predominately on the first evaluation question (CIHR's role in enabling/promoting KT).

The scan will be formulated as an update and expansion on a 2008 publication by Tetroe *et al.* entitled 'Health research funding agencies' support and promotion of knowledge translation: an international study.' The scan will use the same sample frame of organizations. A review of each agency's website and public documentation will be performed, and follow-up semi structured interviews with a KT contact person and an

evaluation contact person from each agency will be pursued. Completed data templates will be sent to each organization for validation.

The environmental scan will provide context and evidence surrounding the role of a funding agency in KT processes, the known successes and limitations of various KT funding programs, as well as KT evaluation. A comprehensive review of empirical evidence related to these three subjects will allow for the development of a contextual base for the remainder of data collection phases, and will situate CIHR in comparison to similar organizations around the world. This component of the evaluation will also yield important insights that will contribute to global literature on KT science, specifically filling a knowledge gap in relation to public funding interventions for KT and their evaluation. The Evaluation Working Group will be engaged throughout the process.

### Document review and electronic information system data review

A document and data review will be a significant source of information for this study in order to address each of the evaluation questions. Documentation to be reviewed will include key CIHR publications and Government of Canada publications related to the study topic. The Evaluation Working Group will work closely to identify and locate key documentation that is pertinent to each stakeholder group (*i.e.*, CIHR staff, KT researchers and knowledge users, program users, TBS).

CIHR's EIS data will be used to obtain and analyze applicable information concerning KT funding program applicants. Where necessary, the CIHR Finance Unit will be approached for financial datasets.

Although initial data and document mining will be based on identified questions and indicators, the document and EIS data review will be ongoing throughout the data collection phase. As such, the process will be reactive to the most current discoveries and suggestions from other lines of investigation and provide an ongoing source for triangulation of findings.

### Key informant interviews

Semi-structured in-depth interviews with researchers and knowledge users awarded CIHR KT grants will be conducted to gather information on key stakeholders' perceptions and experiences with CIHR KT funding programs. The qualitative data gathered through the interviews will provide important context to issues explored through surveys and data review. Qualitative data are, for example, particularly useful in understanding why participants hold particular views, or when seeking to understand a more complex interaction or procedure.

Interviews will be conducted with two discrete sample groups, in order to capture a diverse and balanced view of performance. Researchers and knowledge users will be interviewed, where possible from the same funded KT project. The combination of the two perspectives from a single project will be used to elicit the shared and distinct opinions of the two. It is anticipated that this approach will unearth robust detail. Up to 30 interviews will be conducted, or until saturation is reached, with funded researchers ($n \approx 15$ interviews) and funded knowledge users ($n \approx 15$ interviews).

Interviewees will be selected on the basis of the following criteria: funding program used, experience with CIHR/CIHR KT research, research area (CIHR research pillar *i.e.*, biomedical, clinical, health services, social, cultural, environmental, and population), Canadian official language (French or English), and geographic location.

The interviews will be conducted by telephone and versioned interview guides will be developed for the researcher and knowledge user interviews. The tailoring of guides to each stakeholder group will illuminate differing experiences and perspectives. Interviews will be designed to be approximately 45 to 90 minutes in length. All interviewees will be afforded full confidentiality in their responses, and collected notes and recordings will be managed in accordance with the federal Privacy Act. Interview data will be coded and analysed using NVivo software; data will also undergo review by the Evaluation Working Group to identify and recount key subjective experiences of the interviewees using constant comparative analysis (*i.e.*, taking data and comparing it to others that may be similar or different).

### Quantitative survey

A quantitative survey will be used in order to gather more generalizable information related to funding program performance. The quantitative survey will be launched following the key informant interviews. This structure will allow for specific lines of investigation in the survey to be informed by interview responses. Furthermore, it allows for a test of language and question framing issues to be performed in the interactive interview setting, and thus, for the survey to be framed in the most appropriate way for the target population. The survey design was developed through an iterative feedback process with the Evaluation Working Group.

Funded researchers will be surveyed, as well as a counterfactual group [h] of researchers funded through CIHR's non-KT funding opportunities. The partial coverage of the CIHR KT funding programs (*i.e.*, not everyone who is eligible applies to the programs) allows for comparison between a group of KT funding program applicants and non-applicants, and will help identify program effects and impact.

Surveys will be administered to the full population of recipients of each of the five KT funding programs (n ≈ 600). The comparison (counterfactual) group will be selected based on responses to CIHR's research reporting instrument, which was recently piloted. This is CIHR's general end of grant reporting tool, and it has been administered to recipients of open operating grants (not these KT programs).

The survey will be hosted online, and participants will be invited to take part by email. In order to minimize burden on respondents, surveys will be designed to take less than 30 minutes to complete. Questionnaires will be developed with reference to overarching evaluation questions and will be tailored to each funding program, but will also have commonalities to allow for valid comparisons across groups. Respondents will be assured of full confidentiality. The survey will be undergo a pre-test period to allow for corrections and streamlining.

Where appropriate, we will draw on the design of questionnaires used in previous evaluations of KT programs, both within CIHR and externally. Data collected from surveys will be analysed appropriately (*i.e.*, bivariate and multivariate cross examination where statistically robust) using SPSS. Results will be reviewed and interpreted by the Evaluation Working Group.

### Case studies

A total of five case studies will be undertaken in order to investigate and illustrate links between funding program activities and outcomes. A case study method of inquiry will provide empirical data regarding occurrences of KT and a frame of context surrounding the setting where this trend and/or occurrence took place. The case studies will employ a pathway case analysis format. This analysis method is useful when the result of an intervention is known (in our case, an exceptional demonstration of expected KT outcomes), and the starting point of the intervention is relatively similar (in our case, a funded KT project). The pathway analysis allows for the investigation of causal factors of influence affecting the intervention [16]. Case study investigation will supplement other lines of evidence by providing rich and detailed accounts of the knowledge translation process.

One case study will be conducted for each of the five KT funding programs. The selection of one successful funded project per program will be an interactive process engaging the Evaluation Working Group Projects will be selected that demonstrate exceptional instances of KT outcomes, so that lessons can be drawn about what pathway factors lead to success.

Case studies will be developed based on a common semi-structured interview process with a funded team of researchers and knowledge users, a review of project documentation, and site visits where appropriate. A common approach to data collection will allow for the analysis of similar issues and questions across varied projects and the meaningful comparison of findings. The approach will be developed through consultations of the Evaluation Working Group, and case study drafts will be reviewed by all group members.

With this in mind, the design of the case study research will not be a 'checklist' approach built against pre-determined indicators. The approach will provide ample flexibility for the documentation of not only the KT process within a project, but equally important, the environment in which the process occurred. Documenting this environment will provide valuable context to the KT processes and to understanding their success.

### External expert review panel discussion

An expert review will be undertaken in order to provide expert insight into the CIHR KT funding programs and to provide an arm's length assessment of the evaluation and its findings. The perceived position of CIHR as a Canadian and global leader in KT provides a unique opportunity for attracting the interest of leading subject area experts to provide advice and opinion on CIHR funding program strategy. At the same time, this position of leadership necessitates critical review by the most accomplished of specialists. Reviewers invited to participate the panel will be KT specialists of international repute, the majority being from countries other than Canada; some Canadian experts who have received funding from CIHR may be included. No CIHR staff will be on the expert panel in order to reduce bias in interpreting the data.

The study will be designed to provide a forum for discussion between leading KT area experts. The panel will also review the data, analysis and interpretations of the Evaluation Working Group, and be asked to comment on the rigour and accuracy of the evaluation. More precisely, our deliberative approach will involve an expert group, a series of iterations where information is collected, processed by a moderator, and returned to the Evaluation Working Group members for further analysis based on collective input. The process will allow for inferences to be drawn by leading thinkers in the field.

Issues explored in the study will relate to CIHR KT funding programs as well as the wider CIHR KT strategy. Primarily, evaluation questions one and two will be the major focus of this line of investigation. However, the study will be timed to conclude the data collection phase so that key issues arising from each line of evidence can be explored in greater depth through the method.

Data collection sessions and communications will be moderated by the Evaluation Working Group in order to ensure neutrality. In order to ensure meaningful results,

the Evaluation Working Group will also be fully engaged in the design of the instrument and the selection of participants.

### Analytic approach: Triangulating data from multiple sources

The five methods of data collection described above fit together as part of a data triangulation strategy. The components were designed and will be sequentially carried out in order to iteratively influence the design of subsequent components; in this way, the protocol cumulatively builds on each data type. These multiple sources of data will serve to uphold rigour in our analysis because findings from each component will be cross-checked for consistency and investigated where discrepancies arise.

### Reporting approach

The study protocol (this document), is the first major report stemming from the planned evaluation. The purpose of this report is to encourage the process of this evaluation to be shared and criticized, and thus, to encourage learning about best practices in the evaluation of KT.

Final results of the study will be reported on in aggregate form in a final evaluation report. Once finalized, this evaluation report will be submitted to TBS and made publicly available on CIHR`s website.

Additional publications, presentations, and other dissemination items/events will be crafted wherever possible and appropriate, and may be prepared for any of the data collection methods individually or in combination. Given that a key driver of this research is the lack of knowledge surrounding KT effectiveness, optimal approaches to funding KT, and the evaluation of KT, reporting on the process and results of this study becomes an essential purpose. We also plan to write a paper on our experience conducting the evaluation in this way.

### Ethical considerations

The project is being performed under the auspices of CIHR's requirement to evaluate its expenditures as is mandated for all public organizations in Canada's Treasury Board Secretariat *Policy on Evaluation*. As a part of our relationship with TBS, the research undertaken in the evaluation of federal public expenditures is ethically authorized under the *Values and Ethics Code for the Public Service* and the *Privacy Act*. Even as a federal funding agency responsible for the development and ongoing management of the *Tri-Agency Policy on Ethical Research* our evaluation research is ethically authorized under the aforementioned federal policy, code, and act without Research Ethics Board review.

However, the study has also been approved by the Ottawa Hospital Research Ethics Committee. Full measures will be taken to uphold research ethics in accordance to our relationship with TBS and the Ottawa Hospital Research Ethics Committee conditions.

Funding for the evaluation will come from that portion of the CIHR corporate budget allocated to the systematic and regularly scheduled evaluation of the CIHR grants and awards programs.

## Discussion

In addition to the routine challenges of undertaking a complex evaluation with multiple data sources and stakeholders, there may be some unique ones related to this evaluation. In particular, an evaluation that actively engages program owners may raise concerns about its independence. Another potential challenge relates to conflicts that may arise during the evaluation between members of the Evaluation Working Group, and how they should be resolved.

To minimize the risk of any biases being introduced in the evaluation, we built in a number of checks and balances in our protocol design. However, it should be noted that CIHR's current approach to evaluation does involve engagement of the program owners (*i.e.*, staff who develop and administer funding opportunities) in reviewing data and recommendations. These program-owners may have vested interests in the program, and may wish to influence the recommendations. CIHR's governance structure is designed to minimize the occurrence of this. An oversight committee exists that reviews all evaluation plans and reports to ensure that the appropriate methodologies are used, analysis is undertaken, and that recommendations are supported by evaluation data. This process is in place for the KT evaluation we are proposing to undertake.

Another way we have designed the evaluation to minimize the introduction of bias is the expert review panel. This panel will review the data and the interpretations developed by the Evaluation Working Group and offer an independent opinion on the analysis. Ultimately though, it is the integrity of the people involved that must be relied upon to ensure the evaluation is undertaken in a rigorous and transparent fashion. CIHR evaluators and other staff operate under a government-wide code of conduct and perform their duties with professionalism and due diligence, and the Evaluation Working Group members have all be sensitized to reflect on their individual potential biases.

While disagreements or tensions among the Evaluation Working Group are not anticipated given the good working relationships already existing between the members of the group, we do recognize that during the course of the evaluation, differences of opinion may arise

given the different perspective of group members. We have agreed that ongoing open and frank discussions during our meetings will be a mechanism for addressing any conflicts. Should the Evaluation Working Group fail to be able resolve conflicts on its own, these issues will be brought to the oversight committee.

In sum, the protocol and results of this evaluation will be of interest to those engaged in the theory, practice, and evaluation of KT. The dissemination of the study protocol and results to both practitioners and theorists will help to fill a gap in knowledge in three areas: the role of a funding agency in facilitating KT, the outcomes and impacts of KT funding interventions, and how KT can best be evaluated.

## Endnotes

[a]For further detail on the TBS policy suite see: http://www.tbs-sct.gc.ca/cee/pol-eng.asp

[b] DE and KTS funding opportunities are distinct programs designed to support end of grant KT.

[c] KT research projects are funded through CIHR's Open Operating Grant program.

[d] An external expert on KT (MM) was involved in each step of the evaluation planning process and sat as a member of the evaluation working group.

[e] This excludes partnership programs. The Partnerships Branch of CIHR was consulted as a part of the planning phase of this evaluation. Results of this consultation indicated that the evaluation of partnerships programs within the portfolio would not yield useful results for program management in the context of a KT level evaluation.

[f] Commercialization programs are not included in the evaluation as they fit into a separate envelope of CIHR KT focus and strategy.

[g] A logic model is an illustrative tool used to provide a simple, visual representation of the theory of change of an intervention.

[h] The measurement of a counterfactual group is a natural and social science method of discerning causality. In our case, a group of program participants will be compared to a group of individuals who did not participate in the program. Comparison between the two groups against appropriate evaluation questions will allow for the claims about the attribution that programs have had toward responses to these questions. It should be noted that sampling techniques and the statistical significance of results must be carefully considered in this method.

## Logic model narrative

KT has two bodies of officers, strategic leads and program officers. The activities of the KT suite of programs at CIHR have many similarities and therefore, are described together, except for A5.

### Strategic leads

Strategic leads research, design and implement CIHR's KT strategies. These activities include:

- Designing programs and funding opportunities, including the formulation and modification of program regulations and processes
- Designing literature
- Offering training opportunities
- Conducting Research in the area of KT
- Running KT events
- Promotion and communication activities

### Program officers

- A1-A4:
    - Administration, including application processing, organization of peer or merit review, notification and post-award notification
        - MPD and KTR programs have peer review competition
        - Knowledge Synthesis, PHSI and K2A programs have merit review competitions
            - Monitoring of performance of program activities and outcomes

### KTR review panel (A5)

- The KT research panel reviews all KT related applications received in Open Operating Grants competitions

### Outputs

- O1 - Knowledge synthesis grants awarded:
    - Knowledge synthesis grants provide funding to researchers who intend to produce scoping reviews or syntheses that meet the needs of knowledge users in all areas of health.
    - Grants are expected to increase the capacity of researchers to identify new, relevant avenues for exploration that have not yet been investigated that respond to decision makers/knowledge users' needs.
- O2 - PHSI grants awarded:
    - Researchers and decision makers enter into partnerships to conduct applied and policy-relevant health systems and services research that respond to the needs of healthcare decision makers.

- Partnerships can be project specific (partners that the researchers identify themselves with and with whom they negotiate) or competition specific (CIHR negotiated competition partnerships). Partners providing financial assistance are not required to be team members.

- O3 - K2A grants awarded:
  - Grants are awarded to move knowledge into action by linking researchers and knowledge users located in the same community or region.
  - The development, implementation and evaluation of cutting-edge KT research and approaches are also supported.

- O4 - DE and KTS grants awarded:
  - Grants are awarded to support meetings, and/or dissemination activities consistent with the mandate of CIHR and relevant CIHR Institutes, Initiatives or Branches.
    - Dissemination Events support the organization of events focused on the communication of health research evidence.
    - The KT Supplement supports KT activities that follow a CIHR grant/award where further dissemination is appropriate.

- O5 - KT research grants awarded:
  - Grants fund research directed toward developing theory, evidence and innovation to define the determinants, implementation and uptake of health research evidence into practice.

**Immediate outcomes**

- IMM 01 - Meaningful knowledge user and researcher partnerships established
  - Partnerships between researchers and knowledge users are established, with knowledge users active in the research process

- IMM 02 – Knowledge generated
  - Funded projects result in the generation of knowledge.
  - Quality knowledge includes syntheses of related research findings

- IMM 03 - Relevant research results are disseminated and/or applied by partners and knowledge users
  - Researchers and knowledge users work together to address relevant research questions and to exchange and apply knowledge to solve health and health system problems. This results in research findings that are relevant to the knowledge user partners.

- IMM 04 - Advancement of KT science
  - KT-funded grants advance the knowledge of KT in areas such as new approaches to KT, innovative KT tools, research into new strategies for facilitating the translation of findings into practice, *etc.*

**Intermediate outcomes**

- INT 01 - Knowledge users and researchers learn from each other: Researchers/knowledge users are active in post-research knowledge translation activities. Knowledge users are well informed by relevant research.
  - By bringing both researchers and knowledge users together, it is expected that research results will translate to actions that strengthen Canada's healthcare system and/or improve the health of Canadians
  - KT capacity is developed, increasing the KT expertise in Canada

- INT 02 - Knowledge users are informed by relevant research: Application of research findings by knowledge users
  - The inclusion of knowledge users within the research process fosters greater ownership among knowledge users. This results in improved rates of application by knowledge users.
  - Application includes the awareness of findings among knowledge users, influence/inclusion of research findings in policy decisions, adoption of findings into practice, *etc.*

- INT 03 - Generalizable knowledge is created and disseminated
  - Research results from funded studies are made widely applicable and disseminated outside the sphere of knowledge users and researchers directly related to the project.

## Long term outcome

Ultimately, the KT suite of funding programs are intended to facilitate the translation of research into application in society at large, resulting in the improved health for Canadians, more effective health services and products and a strengthened Canadian health-care system. The KT suite of funding programs are aimed to work together to improve KT capacity in Canada, improve knowledge of KT and integrate both researchers and knowledge users in the research process, improving the relevance and timeliness of research findings.

### Abbreviations

CIHR: Canadian Institutes of Health Research; KT: Knowledge Translation; TBS: Treasury Board Secretariat; PHSI: Partnerships for Health Systems Improvement; K2A: Knowledge to Action; iKT: Integrated Knowledge Translation; DE: Dissemination Events; KTS: Knowledge Translation Supplement; OOGP: Open Operating Grants Program; EIS: Electronic Information System.

### Competing interests

RKDM is an Evaluator at CIHR. As Principal Evaluator, RKDM is responsible for the production of evaluation reporting for program development and meeting requirements of TBS. IDG is the Vice President of Knowledge Translation and Public Outreach at CIHR. In this role and in the role of Principal Evaluation User, IDG is ultimately responsible for the KT funding programming being evaluated. KB is an Evaluator at CIHR. YC is Senior Knowledge Translation Specialist at CIHR. SEC is Knowledge Translation Manager at CIHR's Institute of Gender and Health. MM is chair of CIHR's K2A merit review panel. CM is a Junior Evaluator at CIHR. RM is Director of CIHR's KT Branch. AM is Manager, KT Initiatives at CIHR. DP is Manager of CIHR's Evaluation Unit. JMT is a Senior Advisor at CIHR. JT is a Junior Evaluator at CIHR.

### Authors' contributions

All authors contributed to study conception and participated in critically appraising and revising the intellectual content of the manuscript. All authors read and approved the final manuscript. RKDM is Principal Evaluator for this study. IDG is Principal Evaluation User for this study.

### Author details

[1]Evaluation Unit, Canadian Institutes of Health Research, 160 Elgin Street, Ottawa, ON, Canada. [2]Knowledge Translation Portfolio, Canadian Institutes of Health Research, 160 Elgin Street, Ottawa, ON, Canada. [3]School of Nursing, Faculty of Health Sciences, University of Ottawa, 451 Smyth Road, Ottawa, ON, Canada. [4]Institute of Gender and Health, Canadian Institutes of Health Research, University of British Columbia, 6190 Agronomy Road, Vancouver, BC, Canada. [5]School of Nursing, University of Northern British Columbia, 3333 University Way, Prince George, BC, Canada.

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**Chapter 4 –**

# *Translating research into action: An international study of the role of research funders*

**Summary**

This publication reports the results of an international review of 26 research funders and their means of supporting KT. The scan was conducted using website analysis, document reviews, a template-based survey, and in-depth qualitative interviews. The publication presents several novel conclusions: 1) funders are increasingly interested in supporting KT but have few evidence-based strategies for doing so; and 2) funders desire better methods for evaluating their KT support efforts. These results held significant influence over the direction of the remainder of the dissertation, generating impetus for research streams 2 & 3. Within the Funders' KT stream, this publication broadens the scope of analysis. Whereas chapter 3 presents a rich account of KT practice at a leading KT funder, here I cast light on the international landscape.

**Role of the PhD candidate:** As first author of the paper, I led study conceptualization (a t2 replication of Tetroe et al. 2008), data collection and analysis, wrote the first draft of the manuscript, facilitated/elicited feedback from all co-authors, edited and revised the final manuscript, and managed the submission for publication in *Health Research Policy and Systems*.

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Health Research Policy and Systems

RESEARCH Open Access

# Translating research into action: an international study of the role of research funders

Robert K. D. McLean[1,2*], Ian D. Graham[3,4], Jacqueline M. Tetroe[5] and Jimmy A. Volmink[1]

## Abstract

**Background:** It is widely accepted that research can lead to improved health outcomes. However, translating research into meaningful impacts in peoples' lives requires actions that stretch well beyond those traditionally associated with knowledge creation. The research reported in this manuscript provides an international review of health research funders' efforts to encourage this process of research uptake, application and scaling, often referred to as knowledge translation.

**Methods:** We conducted web-site review, document review and key informant interviews to investigate knowledge translation at 26 research funding agencies. The sample comprises the regions of Australia, Europe and North America, and a diverse range of funder types, including biomedical, clinical, multi-health domain, philanthropic, public and private organisations. The data builds on a 2008 study by the authors with the same international sample, which permitted longitudinal trend analysis.

**Results:** Knowledge translation is an objective of growing significance for funders across each region studied. However, there is no clear international consensus or standard on how funders might support knowledge translation. We found that approaches and mechanisms vary across region and funder type. Strategically tailored funding opportunities (grants) are the most prevalent modality of support. The most common funder-driven strategy for knowledge translation within these grants is the linking of researchers to research users. Funders could not to provide empirical evidence to support the majority of the knowledge translation activities they encourage or undertake.

**Conclusions:** Knowledge translation at a research funder relies on context. Accordingly, we suggest that the diversity of approaches uncovered in our research is fitting. We argue that evaluation of funding agency efforts to promote and/or support knowledge translation should be prioritised and actioned. It is paradoxical that funders' efforts to get evidence into practice are not themselves evidence based.

**Keywords:** Knowledge translation, Knowledge mobilisation, Integrated knowledge translation, Research use, Research funding, Research evaluation, Research impact

* Correspondence: rmclean@idrc.ca
[1]Faculty of Medicine and Health Sciences, Stellenbosch University, Tygerberg, South Africa
[2]Policy and Evaluation Division, International Development Research Centre, Ottawa, Canada
Full list of author information is available at the end of the article

## Background

It is widely accepted that research can lead to improved health outcomes. However, uncovering health knowledge through research can be challenging, costly and time-consuming, and may fail to produce meaningful advances. Still, the expected positive benefits associated with knowledge creation have led governments, foundations and private institutions across the globe to dedicate envelopes of their tax-base or endowment to this endeavour. Around the world, recent estimates suggest that over US$ 100 billion is spent on biomedical research alone in a single year [1].

That being said, the benefits of knowledge are rarely achieved by its creation alone. Knowing what to do with health-related knowledge – how to access it, appraise it, tailor it for context, apply it in the practical world and know when it is not appropriate for practical application – is an entirely different challenge. Evidence indicates that health knowledge continues to be converted into practical applications in a slow and inconsistent way [2, 3]. The rush of publicly funded organisations to address this issue has been well documented in primary research and systematic reviews [4, 5]. Further, research funding agencies have also answered the call. Effectively, research funders have financed another charge for unlocking the power of knowledge, by increasing their focus on the conversion of knowledge into action. In this paper, we refer to this as knowledge translation (KT). Simply put, KT is the process of turning the knowledge that is generated in research studies into use in the real-world. For example, an improved product or device, a new policy or practice guideline, or a more accessible and thus equitable programme. The most broadly accepted definition of this process is offered by the Canadian Institutes of Health Research (CIHR), which uses the term KT to articulate to their Canadian constituency a support of:

> *"A dynamic and iterative process that includes synthesis, dissemination, exchange, and ethically-sound application of knowledge to improve the health of Canadians, provide more effective health services and products, and strengthen the health care system."* [2]

The primary objective of the research reported in this manuscript is to provide an international overview of the state of health research funders' efforts to promote and support KT. To address this objective, the research takes a broad view, looking across an international sample of 26 funding agencies to identify trends and themes, rather than taking a deep dive into the particular practices of any single agency. In addition, the data collected and analysed in this manuscript builds on our previous work [6], which allows for longitudinal trend analysis. In our 2008 project, 33 health research funding agencies from around the world were reviewed to learn more about their KT roles and activities [6]. In this follow-up, we have replicated the study design from 2008, and have been able to include 26 of these agencies. A full account of our methods, findings and conclusions are provided in the following sections of this paper.

We believe the results of this study hold immediate practical value. The primary intended users of this study are health research funders. We hope this international stock-taking will facilitate evidence-informed reflection and debate amongst funders. Secondary users of this work will include health and science policy-makers, as well as researchers interested in KT (both those interested in the study of KT, but also those wanting to learn more about how they are being supported by funders to do KT).

### Why focus on funders?

Health research funders are just one of many actors in the pursuit of translating knowledge into action. Many actors, including but not limited to researchers, governments, patients, activists and taxpayers, have grown increasingly concerned with research being solution-oriented, and each plays an important role in ensuring an effective balance is struck between the creation of new knowledge and its application to health needs.

Research funders are rarely in the business of research implementation. However, we argue that the role of the research funder in KT is particularly pertinent. Funders control access to resources and therefore hold a position of power. This power can be used to stimulate and incentivise action on the part of the research community, including researchers, brokers and research users.

Evidence shows that funders contributing to KT have potential for impact. In spite of identified roadblocks in the knowledge-to-action pathway, studies examining the return on investment of public research have shown ample evidence of value [7, 8]. In simpler terms, research is a good investment in the public good. For example, one study performed by the Council of Economic Advisors to the President of the United States [9] demonstrated that the average social return on government investment in research and development was above 50%, a figure that was at the time, and still is, far greater than other areas of investment, including private sector research and development [9]. As impact assessment models that better capture the hard to measure 'social impacts' of research continue to evolve, we expect to see investments in research appearing even more attractive. Understanding how KT is supported by funders will help to ensure these investments generate the greatest return for people and society.

At the same time, the two primary stakeholders of the health research funder (the public and the academic community) have voiced clear interest in improved application and coordination of KT interventions by funders. The first stakeholder group, the public (often the research funder's funder, and always the intended long-term beneficiary), has asserted a concern that governments pay greater attention to ensuring the practical utility of research they fund [10]. The second group, the academic community (the research funder's primary beneficiary) has increasingly turned to funders to support their desire and build their capacity to meet this growing public call for knowledge translation [11, 12].

## Methods

### Study design

This research was undertaken with the intent of providing a comprehensive account of the international state of KT support offered by health research funding agencies in high-income countries. We adopted a longitudinal study design, wherein data from the same cohort was gathered across subsequent intervals in time. To do this, we purposefully grounded our study design in the work of Tetroe et al. [6] and McLean et al. [13].

#### *Theoretical frameworks*

Two theoretical frameworks were employed to support data analysis. One to categorise KT activities and a second to classify evaluation activities at funding agencies.

The first, in which we categorise, describe and provide our assessments of funding agency support for KT, is derived from the work of Lavis et al. [14]. In their 2006 paper, Lavis and colleagues propose a framework for assessing country-level efforts to link research to action with a view to "*inform country-level dialogues about the options for linking research to action*" [14]. This framework was applied in our data analysis as it provided an internationally recognisable system for KT activity classification and interpretation. The framework outlines three components into which we classify funding agency KT activities, these are (1) push activities, (2) pull activities, and (3) linkage and exchange activities (Box 1). For the reasons above, we believe this is a useful and rigorous means of analysing the KT activities of funding agencies. We caution that this framework does not facilitate a specific review of 'priority-setting activities' or 'responsive grant-making', i.e. when funding agencies strategically prioritise topics, disciplines or objectives for the research they fund. The KT activity classification framework employed here includes funding that has been 'strategically prioritised', but it does not examine the act of priority-setting separately.

**Box 1 Knowledge translation activity classification framework**

**Push** – activities and programmes targeted at the 'pushing' of research-produced knowledge into the hands of appropriate knowledge users – users who may not have otherwise been aware of the research and its implications. Examples include research communications, funding opportunities or funder activities, or typical end-of-grant funds that an agency may provide to a researcher to encourage the dissemination of findings such a publication in an Open Access journal, or the creation of a plain language findings brief.

**Pull** – activities and programmes that facilitate knowledge users' access to research results. For example, a forum where researchers are brought to discuss an issue of importance with identified knowledge users.

**Linkage and exchange** – activities and programmes that support the establishment of partnerships between researchers and knowledge users through multiple parts of the process of research design, execution and/or dissemination. Linkage and exchange is also referred to as integrated knowledge translation and co-creation/co-production [35–37]. An example would be a research grant that required both a researcher and a knowledge user to apply in partnership for funding, representing a break with the traditional researcher curiosity-driven approach to science. This more participatory approach may also involve non-researchers (e.g. patients, clinicians, managers, etc.) as reviewers in the peer-review process.

Note: This is a very brief description of these well-developed concepts of promoting research use. Further reading on the subject could include Lomas [38] and Lavis et al. [39].

To conduct an analysis of evaluation activities, we developed a new framework for funding agency evaluation activity classification. The framework is derived from theory and guidance on best practice in evaluation [15–19], as well as the work of Mintzberg on organisational strategy [20], and that of the Canada's International Development Research Centre on how strategy and evaluation interact [21, 22]. Mintzberg argues that organisational strategy is not just what we say we do, it is also what we do [20, 22]. Because evaluation is used by organisations to understand what has been done, in essence, evaluation activities can be used to shine light on a picture of organisational strategy. In this research, we aimed to utilise this dynamic conceptualisation of organisational learning and strategic management by developing a framework for the analysis of funders' KT actions.

Box 2 below provides further explanation of the framework that was developed and used for data analysis[1]. In short, it outlined three areas of strategy, namely (1) the 'the intended strategy' (what was planned), (2) 'the realised strategy' (what actually occurred), and (3) 'the emergent strategy' (the lessons learned and adopted into practice) of the funding organisation.

**Box 2 Intended → Realised → Emergent (IRE) framework for strategy classification**

**Intended strategy** (the planned knowledge translation (KT) strategy) – Includes actions such as defining KT, setting clear KT objectives or goals, mapping these objectives within internal and external structures, mechanisms and constraints (in a realist or classical empiricist way), defining stakeholders (intended and unintended), drawing identified factors into implementation theories for KT programmes.

*Evaluator's use 'intended strategy' to first understand programme purpose and to then construct measures for programme or organisational assessment. Robust evaluations will consider intended strategy during methodological design. Typically, these intentions are developed by evaluators in constructs such as 'theories of change,' 'logic models,' 'logframes,' etc. All of these tools hold the same general purpose of articulating a programme's intended strategy and results in more depth and detail than a stated objective.*

**Realised strategy** (the KT strategy that was executed) – Includes the actual KT programmes, initiatives and activities of the funding agency.

*Evaluators use these elements as the 'object of assessment' or 'evaluand'. Evaluation activities related to this will include actions such as designing evaluation studies, monitoring and collecting data, analysis and interpretation of data and communicating findings. Here, evaluations would identify KT support that was working as intended and that which was not as well as unpacking the mechanisms, contexts and systems that govern success.*

**Emergent strategy** (KT strategy evolving from evaluation use) – Includes the broad range of actions related to using evaluation findings in KT programme refinement, development, overhaul or cessation (i.e. evidence-based decision-making). In other words, the evidence-based direction that an agency embarks upon.

*Evaluators produce knowledge related to a realised strategy that, through the complex process of uptake and implementation, is built into the re-thinking of strategy (e.g. confirming status quo, course correction or complete cessation). In the evaluation literature, this is referred to as 'evaluation use' and is manifested in evidence-based action.*

### *Longitudinal design and sampling frame*

Our research was designed to provide a follow-up on the work of Tetroe et al. [6]. We drew our sample of funding agencies from the sample contacted in this 2008 study. With this approach we were able to undertake analysis of the same cohort at two discrete intervals in time. In the Tetroe et al. [6] study, a judgement sampling approach was employed to select funding agencies based on particular criteria of interest to the research team undertaking that study [23]. These criteria were (1) nationally scoped agencies and other disease-specific voluntary health organisations and (2) agencies that represented a continuum in or contrast in their KT support activities.

## Data collection protocol

### *Website reviews and agency templates*

A data collection template was developed to gather information from the website and accessible publications of each funding agency. These templates were based on the data collected in the Tetroe et al. [6] study (keeping to our objective of conducting longitudinal analysis) and the theoretical categorisation of KT activities provided by Lavis et al. [14]. Templates were populated with information such as mandate, annual budget, types of KT support activities and KT evaluation activities. Following this initial web-based documenting process, the templates were sent via email to senior representatives of each agency for validation, updating and addition of data that were not available on the agency website or in accessible publications. The agencies were then asked to return the completed template to our study team, at which point a telephone interview was scheduled between the study research team and the agency.

### *Semi-structured qualitative interviews*

We aimed to conduct telephone interviews with at least two representatives of each agency, including one senior representative of the KT function and one senior representative of the evaluation function. It should be noted that, in some cases, the two senior officials were the same individual, in some agencies an evaluation function did not exist, and in others a larger group of representatives desired to take part in the interview process and we agreed to this. The interview protocol was based on the completion of the agency template and a series of follow-up questions based on the flow of the discussion and emergent data of interest. This approach allowed us to complete the deductive learning exercise driven by the predefined template, but also to complement these data with new information on why and how any KT activities were being implemented in the eyes of the funding agency, and to allow the interviewer to probe further on issues of particular interest [24].

All interviews, except the CIHR interview, were conducted by telephone in either French or English. The CIHR interview was conducted in-person in the CIHR

Ottawa, Canada, office. On average, interviews lasted between 30 and 90 minutes. Notes from any French language interview were translated into English by two bilingual members of the research team independently, and independent translations were cross-checked for consistency and accuracy. To minimise the threat of description or interpretation bias following the interview, the notes and the completed agency templates were returned to each agency for validation.

### Research ethics

Ethics approval for this project was granted by the Ottawa Hospital Research Institute, in Ottawa, Ontario, Canada.

## Results

The following section of the paper reports on the results of our research and preliminary interpretation. The section is divided into three parts. In the first, we present an overview of the 26 agencies included in the research. In the second, we explore the role of KT at the funding agency, in other words, how funding agencies have positioned KT for their agency in a qualitative and quantitative sense. In the third, we outline the KT initiatives being offered and undertaken at the funding agency, taking stock of and analysing actual KT strategies, programmes, funding mechanisms and evaluations of these efforts.

### Agency overview (region, focus, funding source, budget)

Table 1 provides a brief overview of the regions and agencies included in the study. It also displays those which were not in the study, but were involved in the t1 period research (from here forward the Tetroe et al. [6] project will be referred to as t1 and this project as t2). The seven agencies not included in this report were removed from the sample due to an inability to schedule an interview or an interview request being declined. Although it would have been possible to proceed with using publically available data, it was deemed that this would lead to questions about accuracy. Further, a brief description of the focus of each agency is included as well as the agencies' overall annual budget at the time of contact.

### The position of KT at the funding agency

KT can be supported by a funding agency in a multitude of ways; however, the way that KT is positioned within the funding agency – explicit or implicit – is an important indicator of the level of significance it holds and the impact it may eventually have. We have used five measures to allow us to identify and investigate the intended role for KT at each of our sampled funding agencies. Then, by aggregating data, we can examine regional, global and longitudinal trends. Our five measures are (1) language used to describe KT, (2) mandating KT, (3) a senior agency members' priority rating of KT, (4) human resources devoted to KT, and (5) financial resources devoted to KT. Results related to each of these measures are reported in turn in the following sections of the manuscript.

#### *KT terminology*

As a follow-up to the t1 study, we looked to identify terms that funding agencies were using to describe the concept of translating research into action – what we refer to in this paper as KT. Through agency website scans and follow-up interviews with agency staff, we identified a total of 38 terms in use by the 26 agencies studied.

In the t1 study, 29 terms were identified, and therefore, over time, there has been an increase in the number of terms used to describe the KT concept within funding agencies, even though the number of funders studied decreased by seven between the two study periods (Table 2). One might interpret this growth in terminology over time in a number of ways. On the one hand, it could be seen as a popularisation of the concept, as further definitions are being used. On the other, it could be interpreted as a lack of coordination and consistency in KT conceptualisation from one agency to another. We discuss our understanding vis-à-vis other findings of our research in the Discussion and Conclusions section of this paper.

#### *Mandating KT*

Perhaps the most palpable indicator of KT's intended prominence at a funding agency is whether or not the agency includes the concept in its mandate. A mandate is the publically stated raison d'etre of an organisation, and is often legislated by an external body such as a Parliament or Board of Directors. To assess this, we scanned agency mandates to look for terms or concepts describing KT – not specifically the term knowledge translation. We validated our result for each agency in the follow-up interview with the funder. Of the 26 funding agencies involved, we identified that 20 (77%) included the concept of KT directly in their agency mandate. This result indicates that the majority of research funders in our sample publically declare that KT is a part of their core mission. However, data also indicates that the inclusion of KT in the mandate is an emerging trend. As Fig. 1 shows, the number of agencies including KT in their mandate has increased from t1 to t2.

Every global region studied demonstrates an increase in the inclusion of KT in funding agency mandates, save Australia, where mandate inclusion did not decrease but remained unchanged. At the individual agency level, we found that none of the agencies that included KT at t1 had removed the concept at t2.

Stemming from terminology and mandate reviews, we aimed to collect data on additional indicators of the intended role of KT at the health research funding

**Table 1** Overview of funding agencies studied

| Country | Abbreviation | Organisation | Source of funds; Regional focus | Annual budget (CAD millions converted at time of contact) |
|---|---|---|---|---|
| Total Funding Agency Sample ($n = 26$) | | | | |
| Australia ($n = 3$) | CCA | Cancer Council Australia | Charitable; National | 16.5 (research specific) |
| | NHFA | National Heart Foundation of Australia | Charitable; National | 71 |
| | NHMRC | National Health and Medical Research Council | Public; National | 774.5 (research specific) |
| Canada ($n = 9$) | AI (formerly AHFMR) | Alberta Innovates (formerly Alberta Heritage Foundation for Medical Research) | Public; Provincial | 91.9 |
| | CHSRF | Canadian Health Services Research Foundation | Public; National | 15.2 |
| | CIHR | Canadian Institutes of Health Research | Public; National | 1000 |
| | FRSQ | Fonds de recherche en santé du Quebec | Public; Provincial | 100 |
| | MSFHR | Michael Smith Foundation for Health Research | Public; Provincial | 33 |
| | CCRI (formerly NCIC) | Canadian Cancer Society Research Institute (formerly National Cancer Institute of Canada) | Charitable; National | 41 |
| | NSHRF | Nova Scotia Health Research Foundation | Public; Provincial | 4.9 |
| | SHRF | Saskatchewan Health Research Foundation | Public; Provincial | 6 |
| | SSHRC | Social Sciences and Humanities Research Council | Public; National | 350.9 |
| Netherlands ($n = 1$) | ZonMW | Netherlands Organization for Health Research and Development | Public; National | n/a |
| Denmark ($n = 1$) | FSS | Danish Agency for Science, Technology and Innovation – Danish Council for Independent Research – Medical Sciences | Public; National | 44 |
| Norway ($n = 1$) | RCN | Research Council of Norway | Public; National | 1261 |
| United Kingdom ($n = 7$) | AS | Alzheimer's Society | Charitable; National | 124 |
| | CSO | Chief Scientist Office | Public; National | 106 |
| | HF | Health Foundation | Charitable; National | 42 |
| | NHS HTA | National Health Service – Health Technology Assessment | Public; National | 14 |
| | NIHR HS&DR | National Institute for Health Research; Health Services and Delivery Research | Public; National | 18 |
| | UK MRC | UK Medical Research Council | Public; National | 1215 |
| | WT | Wellcome Trust | Charitable; National | 968 |
| United States ($n = 4$) | AHRQ | Agency for Healthcare Research and Quality | Public; National | 370 (research specific) |
| | NIH-NCI | National Institutes of Health – National Cancer Institute | Public; National | 5300 |
| | RWJF | Robert Wood Johnson Foundation | Charitable; National | 400 |
| | VA | U.S. Department of Veteran Affairs | Public; National | 18 |
| Agencies not included from Tetroe et al. [6] ($n = 7$) | | | | |
| France | AFM | Association Française Contre les Myopathies | Charitable; National | n/a |
| | INSERM | Institute National de la Santé et de la Recherche Médicale | Public; National | n/a |
| | MOH | Ministry of Health: Programme Hospitalier de la Recherche Clinique | Public; National | n/a |
| Netherlands | ZN (Formerly CVZ) | Zorginstituut Nederland (formerly College voor Zorgverzekeringen) | Public; National | n/a |
| Sweden | SMRC | Swedish Medical Research Council | Public; National | n/a |
| United Kingdom | UK DH | United Kingdom Department of Health Policy Research | Public; National | n/a |
| United States | CDC | Centre for Disease Control | Public; National | n/a |

**Table 2** Terminology used to describe 'Knowledge translation' (KT) over time

| Terms used to describe KT by participating funding agencies (as reported in interviews) in t1 and not in t2, *n* = 6 | Terms used to describe KT by participating funding agencies (as reported in interviews) in t1 and t2, *n* = 23 | New terms used to describe KT by participating funding agencies (as reported in interviews) in t2, *n* = 15 |
|---|---|---|
| Applied health research | Capacity-building | Action cycle |
| Competing, coordination, co-optation | Diffusion | Application |
| Knowledge cycle | Dissemination | Coordination |
| Science communication | Exploitation | Dialogue |
| The third mission | Getting knowledge into practice | Implementation science |
| Transmission | Impact | Knowledge movement |
| | Implementation | Knowledge promotion |
| | Knowledge communication | Knowledge sharing |
| | Knowledge exchange | Knowledge use |
| | Knowledge management | Manualising interventions |
| | Knowledge mobilisation | Policy and practice cycle |
| | Knowledge transfer | Spread |
| | Knowledge translation | Scaling |
| | Linkage and exchange | Translating research into practice |
| | Popularisation of research | Uptake |
| | Research into practice | |
| | Research mediation | |
| | Research transfer | |
| | Research translation | |
| | Teaching | |
| | Translation | |
| | Translational research | |
| | Utilisation | |

agency. Table 3 displays the results for the three additional measures of KT positioning at funding agencies, namely (3) self-prioritisation of KT, (4) human resources devoted to KT, and (5) financial resources devoted to KT.

### *KT prioritisation*

KT prioritisation is unique to this period of data collection. The intent of introducing this data point was to capture, and subsequently compare, a challenge which arose quite frequently in the qualitative aspects of the t1 research. The difficulty we observed was that agency representatives reported in the interview stage that KT was of a certain priority at their agency, although they did not have precise written policy, budgetary or other 'hard' documented evidence to support this claim. Given that our interviews were performed with senior officials of each agency (in many cases up to the VP level), and that the vision of a leader may potentially be used to judge the importance of an idea, we designed a simple categorical tool for the collection and classification of these claims.

In interviews, we discussed why and how they reached the agency score they did. We found that, when respondents were given the opportunity to explain the numeric rating given to their agency, they frequently asserted that KT was becoming an increasingly important global objective and that the interviewee's individual funding agency was well-attuned to this trend and following suit. This finding is aligned to the data

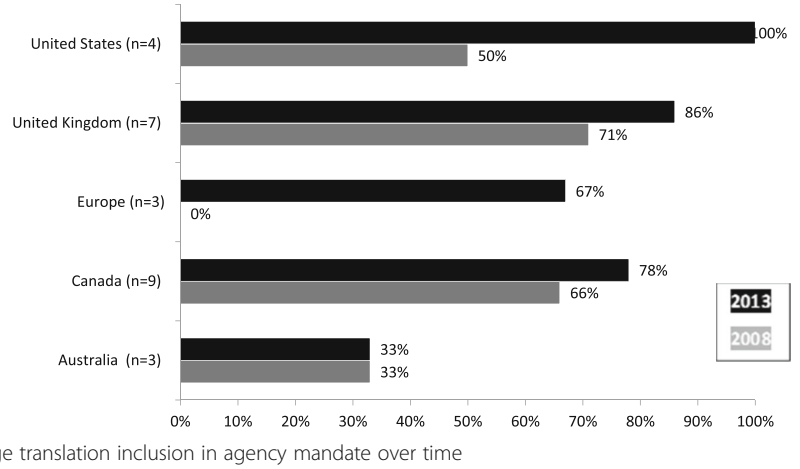


**Fig. 1** Change in knowledge translation inclusion in agency mandate over time

**Table 3** Agency knowledge translation (KT) prioritisation, human resources and financial resources

| Country | Agency[a] | KT prioritisation[b,c] | KT staff[c,d] | Annual budget for KT (CAD millions)[c,e] |
|---|---|---|---|---|
| Australia | CCA | n/a | 1 | 2.9 |
| | NHFA | 'High' | 0 | 44 |
| | NHMRC | 5 | 80 | n/a |
| Canada | AIHS | 5 | 3 | 0.34 + embedded |
| | CHSRF | 5 | Embedded | Embedded |
| | CIHR | 4 | 15 | 30 + embedded |
| | FRSQ | 3 or 4 | 0 | 5 |
| | MSFHR | 5 | 2 | 0.45 |
| | CCSRI | 5 | Embedded | Embedded |
| | NSHRF | 5 | 1 | n/a |
| | SHRF | 4 | 0 | Embedded |
| | SSHRC | n/a | 2 | 24.5–31.6 |
| Netherlands | ZonMW | n/a | 20 | n/a |
| Denmark | FSS | n/a | n/a | Embedded |
| Norway | RCN | n/a | n/a | Embedded |
| United Kingdom | AS | 4 | Embedded | Embedded |
| | CSO | n/a | 1 | 0.62 |
| | HF | 3 | Embedded | 0.40 |
| | NHS HTA | 4 | n/a | n/a |
| | NIHR HS&DR | 3.5 | 2.5 | 2.4 |
| | UK MRC | 5 | 15–20 | Embedded |
| | WT | 5 | 45 | Not fixed |
| United States | AHRQ | 5 | 300 | 31 |
| | NIH-NCI | 4 | 7 | n/a |
| | RWJF | 5 | 35 | 340 |
| | VA | 5 | Embedded | Embedded |

[a]For the full agency names, please refer to Table 1.
[b]For KT prioritisation scores, a 5-point Likert scale was provided to the respondent. The scale was structured as: 5 – Very Important; 4 – Important; 3 – Neither important nor unimportant; 2 – Unimportant; 1 – Very unimportant
[c]No responses were forced in any part of this research, and so, in several instances 'n/a' is recorded as the data point [d]'Embedded' was assigned to the 'KT Staff' column when the agency indicated KT is 'a part' of the duties of all, or a subset, of employees. Though none are assigned to it in particular
[e]The 'Annual Budget for KT' column includes funds reported by the agency for KT specifically. This may include funds for agency staff or KT activities such as grants or awards. Agencies themselves reported these figures, and we interpret that they are best positioned to have decided what counts as KT-specific funds for them; we caution that this does imply different uses of funds were being reported by different agencies

presented earlier demonstrating the growing trend of embedding the KT concept within the agency's mandate. The generally high scores of KT prioritisation across agencies and regions indicate a trend of increasing KT importance within our cohort. However, when compared to other proxy measures of the 'KT role' at an agency (staff and budget), we did not see any particularly compelling patterns emerge.

### *Human resources devoted to KT*

In examining human resources devoted to KT, each agency was asked to self-interpret and self-classify who was considered KT staff. Through semi-structured interviews, we then aimed to identify underlying reasons for these classifications. Interestingly, there is a divergence in who is defined as KT staff across agencies. To give an example, in the United States agencies, definitions of staff varied substantially. The Robert Wood Johnson Foundation held a broad view, including its nine evaluation staff as KT staff, suggesting that a focus on learning and programme improvement are both an evaluative duty and a part of the agency's KT approach. In contrast, the National Institutes of Health National Cancer Institute reported its dedicated Implementation Science Team, a group that works directly on issues of KT conceptualisation and programming with the organisation and with its research community. Many agencies included communications groups in their calculation of KT staff. Further, the Agency for Healthcare Research and Quality suggested that the embedded nature of the

KT work at their organisation meant that all employees should be counted as KT staff. This variation in interpretation of who constitutes KT staff was not restricted to the United States. We did not discern any trends in types of staff (e.g. communications, evaluation, considering all staff as KT) being classified as KT in one region but not in another.

Although not indicative of any generalisable difference in resource support (given our purposeful sampling approach and differences in regional sample characteristics), the data illustrates that the United States currently devotes the largest human and financial resource contributions to the KT objective at the funding agency level.

As human resources devoted to KT was not a variable collected in the t1 study, we were unable to perform any comparative analyses across time.

The over-arching finding of this line of analysis is that there is no generally accepted view of who constitutes KT staff at a research funding agency.

### *Financial resources devoted to KT*

Given that financial resources devoted to KT were measured in both the t1 and t2 studies, we performed various comparative analyses on KT budget data received from each agency. However, none of these proved, in our view, to provide enough insight into KT spending trends at funding agencies to warrant further demonstration and/or data tables in this manuscript. Furthermore, we concluded that there was limited value in presenting changes in KT spending per region or per agency given multiple, significant confounding factors that would limit the ability to interpret such analysis (e.g. changes in total agency budgets versus KT budgets, currency inflation, regional variation in inflation, currency conversation and exchange rate fluctuations over time). That being said, one trend did emerge, namely that, across all regions, the number of agencies that could provide a precise budget figure for KT did not change significantly. In other words, the number of agencies earmarking KT funds remained generally the same across time.

For a closer look at this issue, we unpacked the more recent t2 data further. In summary, less than half of all agencies interviewed (11 of 26) were able to identify a specific amount devoted to KT. Ten of 26 reported that the KT spending of the organisation could not or should not be seen as an independent budget line, but instead that KT was embedded-in across the organisation's expenditures. Seven of 26 agencies were unable to provide any funding details related to KT, which was in contrast with the fact that only one of 26 was unable to publically disclose any budget information. In sum, these data indicate that earmarking KT financial resources is not the norm across any region or the sample at large. To better understand the return on KT activities, this may be a useful area of data for agencies to track more closely in the future.

## KT initiatives

In this section, we turn to the specific programmes, mechanisms, modalities, activities, etc., that funding agencies were using to support KT.

Figure 2 presents the classification of agency initiatives across the three parts of our analytic framework, namely push, pull, and linkage and exchange (see Box 1 in the Methods section of this paper for a full description). Given the sampling approach employed, we caution against advanced quantitative comparative interpretation. We consider these data as categorical.

Most agencies favour linkage and exchange (or integrated KT (IKT)) and push efforts over pull efforts. There were a substantial number of IKT programmes supplementing the funders' support for traditional programmes of curiosity-driven research. Qualitative interview data did not provide any clear conclusion on why

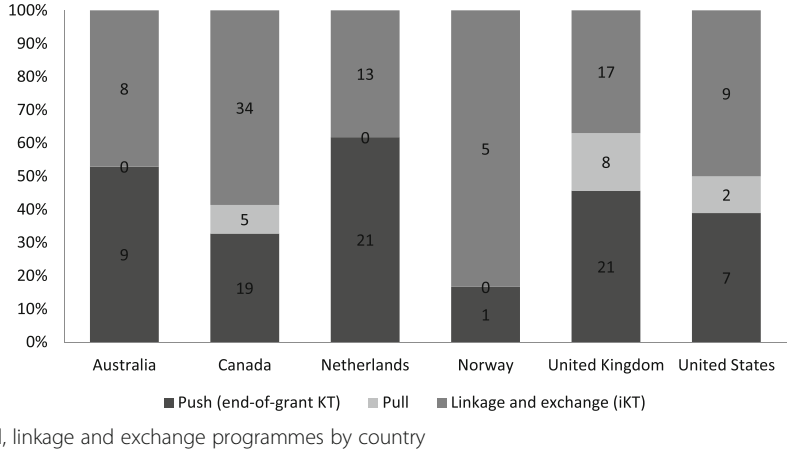


**Fig. 2** Number of push, pull, linkage and exchange programmes by country

these trends toward push and linkage and exchange efforts existed.

Although any regional analysis should be made with caution, a pattern does emerge with regards to programme distribution across category, namely that agencies and regions offer a general mix of programming, which is consistent with what is considered by Lavis et al. [14] to be a favourable approach.

At t1, more attention was paid to the activities the funding agency required of researchers vis-a-vis the activities, either planned or unplanned, of the funding agency in support of KT. To address this, we restructured our classification of programmes in Fig. 3 by grants, awards and fellowships. Note that a single programme – the base unit in our above analysis (Fig. 2) – could include a series of grants or awards or fellowships. It should also be noted that Fig. 3 showcases programmes that were strategically designed for KT and does not include grants, awards or fellowships that were not designed specifically for KT, but may support KT due to the independent decision of a grantee to undertake KT.

The primary finding of this analysis is that the funding agencies are more involved in KT grant dispersion than other forms of KT support activity like awards or fellowships. To facilitate more precise interpretation, a comparison of how this trend in KT support varies from other areas within the health sciences would be a valuable area of additional study, e.g. investigating how the balance of grant, award and fellowship opportunities for KT compare to the balance of opportunities available for clinical trials, laboratory science, vaccinology and health systems research.

## Evaluation

The final area of findings reported in this manuscript describes an investigation of the evaluation of KT being conducted at funding agencies. Evaluation is selected as a focus area for two distinct reasons. First, KT evaluation has been identified as a significant gap in published expert opinion, theoretical research and empirical research [6, 14, 25–29]. Second, in the t1 research, there were no evaluations identified in any of the 33 agencies studied; however, nearly all 33 agencies articulated that plans and designs for evaluations were underway. As a result, a specific follow-up on progress with evaluation was prioritised for t2. In other words, an objective for t2 was to provide more than a stock-taking of programmes and practice at funding agencies, it was also to dig into the evidence guiding these efforts.

Given our specific focus for this study – KT activities/support at the funding agency – we purposefully reviewed evaluation undertaken at the funding agency level only, that is to say, an evaluation that focused on the KT programmes and activities of the funding agency. We did not include any evaluation being done by funded researchers in their own projects or the health interventions of others, even if this evaluation was funded by an agency in our sample (e.g. a large body of work being performed through the National Health Services – Service Delivery and Organization, e.g. [30, 31])[1]. Our aim was to learn about funding agency programmes and practice specifically. Table 4 illustrates evaluation activities being conducted of funding agencies' KT programmes and practice; it utilises the Intended, Realised, Emergent (IRE) framework articulated in Box 1 of this manuscript.

Data indicates that funding agencies are putting considerable effort and resources into thinking through KT theories and objectives but much less into carrying out critical evaluations of these efforts/resources. Indeed, 23/26 funding agencies had a defined and planned KT strategy to some extent (recall 20/26 are currently including the concept in their agency mandate), yet only 7/26 had evaluated KT efforts and only 1/26 could demonstrate that evaluation results had been used to guide KT programmes or practice (i.e. to support

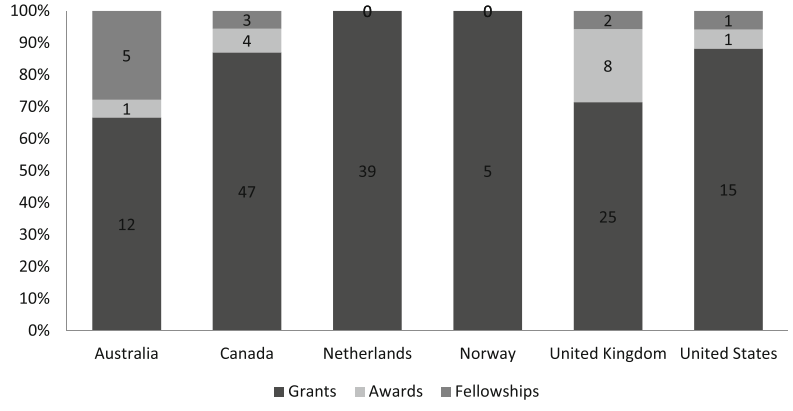


**Fig. 3** Number of knowledge translation (KT) grants, awards and fellowships by country

**Table 4** Intended → Realised → Emergent (IRE) Framework classification of agency knowledge translation (KT) evaluation activities[a]

| | Intended strategy | Realised strategy | | | Emergent strategy |
|---|---|---|---|---|---|
| | Definition; KT objectives; KT implementation theory, etc. | KT evaluation/ learning objectives | Evaluation methods for KT developed | Analysis and communication of findings | Uptake of evaluation evidence by funding agency[b,c] |
| Australia (3) | 2/3 | 1/3 | 1/3 | 1/3 | 0/3 |
| Canada (9) | 8/9 | 5/9 | 3/9 | 3/9 | 1/9 |
| Europe (3) | 3/3 | 0/3 | 0/3 | 0/3 | 0/3 |
| United Kingdom (7) | 6/7 | 5/7 | 2/7 | 2/7 | 0/7 |
| United States of America (4) | 4/4 | 1/4 | 1/ 4 | 0/4 | 0/4 |
| Total (26) | 23 | 12 | 7 | 6 | 1 |

[a]This table includes only those activities focused specifically on KT and omits any which were considered 'embedded' in broader research quality assessments or operational reviews. This decision was based on agency representatives being categorically unable to elaborate what and how KT aspects and activities were 'embedded' in any broader evaluation when probed during interviews. This was corroborated in our review of the evaluation report or other related documentation. [b]AIHS is the only agency to have completed a health research funding evaluation which they could demonstrate evidence to show it has been used to inform agency practice. [c]After the completion of data collection, but before publication of this manuscript, CIHR completed and delivered its KT evaluation to its senior management committee; it is not included in the classification to uphold data consistency

evidence-based decision-making). In other words, a commitment to KT is evident, but learning-focused programming of KT was rare.

A deeper dive into the three components of the IRE framework helps to further understand the agencies' KT strategy. See Box 2 in the Methods section of the manuscript for a full description of the IRE conceptual framework.

#### *Intended strategy*

In terms of 'intended strategy' there is a strong base of activity and effort in our sample of funding agencies. The majority of this effort was in setting a KT definition and outlining a series of KT goals. A minority of agencies had derived implementation theories (e.g. a theory of change) to describe the intended process and results of their KT efforts. One of these was the National Institutes of Health National Cancer Institute's Implementation Science team. This agency has worked to articulate a theory of KT implementation, integrated a research translation continuum, and developed a set of contingencies and considerations into their KT support processes. Another example was CIHR, who had articulated a KT Funding Program logic model, and initiated an evaluation of the organisations strategic intentions for KT, by using this model in the evaluation design to outline expected KT results and critical assumptions.

#### *Realised strategy*

In terms of 'realised strategy', we have included all evaluation activities related to the assessment of realised organisational KT strategy. Table 4 indicates a decline in activities as we move from 'intended' to 'realised' strategy. Some insight into why this was the case was uncovered in the qualitative interviews. While the vast majority of agencies asserted that they deemed the evaluation of their KT funding to be a paramount endeavour, they also informed the research team that they did not have a firm grounding in how to undertake this task. Generally, it was suggested by agency representatives that research evaluation was a difficult undertaking; however, evaluating the translation of research into action was the most difficult component of this problem.

#### *Emergent strategy*

'Emergent strategy' is not surprisingly deficient when considered in relation to the trend of decreasing activity moving from 'intended' to 'realised' strategy documentation. At the time of data collection, only one agency (Alberta Innovates, a Canadian public Provincial funder) was using KT-specific evaluation results to inform decision-making and action.

## Discussion

As health policy, practice and programming continues to lag behind research-generated knowledge, KT remains a crucial objective within the health system. As has been argued in the past [32], the funding agency role in supporting KT has merit for a number of reasons. In this manuscript, we premise this argument on the position that incentive-setting power funders occupy, given the control they hold over financial resources. Playing the role of financier to the research enterprise places funders in an influential position to stimulate action around a particular topic such as KT. As Nobel Prize winning economist Joseph Stiglitz has recognised:

> *"…the scientists whose research and ideas have transformed our lives in the past two hundred years have, for the most part, not been motivated by the pursuit of wealth. This is fortunate, for if they had,*

*they would have become bankers and not scientists. It is the pursuit of truth, the pleasure of using their minds, the sense of achievement from discovery – and the recognition of their peers – that matters most. Of course, that doesn't mean they will turn down money if it is given to them."* [33]

### Positioning KT with funders

The purpose of this research was to take stock of how various funders are supporting KT and how well they are doing. In general, the 26 funding agencies whom we engaged demonstrated that KT is a high and a still growing priority. As mandates are changed (and maintained) to include the concept of KT, we interpret this to mean that governments and other health research funders are concerned with making research useful and actionable.

Previous studies on the role of the funding agency in KT (e.g. [6, 25, 34]) have argued that a common definition and/or classification of KT would be beneficial, and some suggest that a systematic framework to knowledge translation would contribute to conceptual clarity in the field [25]. We do not find evidence to disprove this hypothesis, but the findings of our research give us limited reason for concern. We suggest the diversity of experience across funders, by country, region, agency size and by agency type, is a representation of the diversity of context in which these organisations operate. We see no reason to conclude this is problematic. In our opinion, it is more than likely beneficial that programmes and strategies are contextually grounded.

At the same time, some trending in funder practice is evident. This study has identified further divergence in terminology over time (since 2008). It also uncovers a convergence of KT initiatives which funders are using to further their KT agendas. The prevalence of push efforts and linkage and exchange (or IKT) efforts, and the preference towards grants to support these, appears as a trend across our global sample. The emergence of IKT programming in particular represents a notable shift from traditional research funding approaches that have tended to favour the researcher over research users. Without robust evaluation data we cannot examine the evidence base for why these programmes and mechanisms are favoured, or appraise their effectiveness. However, we can offer some interpretation. First, and perhaps most likely, the similarity in programming and grant making activities might represent the emergence of an accepted framework for KT support based on informal exchanges between agencies. If this is the case, we note some concern that, in the absence of evaluations, the convergence of KT support activities may represent an emerging groupthink process rather than the co-development of a set of proven good practices. Secondly, although we would argue unlikely, these international patterns could be coincidental. Again, further evaluation would help to shed better light on the issue.

### KT evaluation – still, an area for action

In the 2008 t1 study, we identified a significant gap in funders' execution and ability to execute evaluations of KT efforts. As a result, in this t2 research, we set an intentional focus on the issue of KT evaluation in order to learn how evaluation practice had evolved over time and to collect complete evaluations in order to investigate the possibility of synthesis and meta-evaluation.

We aimed to better understand and analyse evaluation activities by developing and applying the IRE framework (Box 2). This tool allowed us to identify, and subsequently investigate, evaluative and strategic strengths and weaknesses across agencies. In essence, the IRE framework enabled us to look beyond a simple count of evaluation reports or the potential undertaking of a synthesis of evaluation findings. Using the framework facilitated meaningful conclusions about the evaluation and strategy process. We would encourage those agencies who wish to improve their evaluation and strategy functions to consider a conceptual framework such as this, in particular for identifying areas for organisational improvement and/or cross-agency exchange, and we suggest the results of this research may provide some starting points. For example, applying the IRE framework highlighted how 'intended KT strategy' is relatively well developed across our sample of funders. Therefore, 'intended strategy' activities such as designing KT funding programmes, setting an organisational KT strategy, or developing KT theories of change, would be an immediately actionable and data-rich area of cross-agency learning and exchange.

Our data shows a substantial base of intended KT evaluation activities across the agencies and global regions in the sample. However, findings also highlight a significant lack of progress in undertaking targeted evaluations of KT, communicating results of these evaluations, and using findings of these evaluations to inform funder practice and policy. At the time of data collection, only one of the agencies in our sample had completed a targeted evaluation of KT. Though several agencies had evaluations that were underway or planned, it is important to recall the same was found in the t1 study (when nearly all agencies reported plans for KT evaluation). A clear conclusion is that evaluative data is not being used to measure progress against the objectives set out in earlier stages of KT programme design and planning. Given that the underlying objective of KT lies in moving evidence into action, it is paradoxical that the funders of KT do not employ this philosophy in their own work.

At the same time, this research has uncovered a lack of methodological know-how for evaluating KT as a major stumbling block for agencies who generally indicate a genuine interest in improving KT practice. As such, we suggest this is an area ripe for researcher (not just funder) focus. We also learned that funding agencies, themselves faced with budget austerity, do not always have the ability to make evaluations a priority, and especially the more challenging evaluations such as one focused on KT. Although we can understand this predicament, we do not agree that underfunding critical reflection is a sustainable cost-savings approach. We hope that identifying the persistent lack of KT-focused evaluation at funding agencies, both globally and across type of agency, will assist in kick-starting evaluative work. In our interviews with funding agencies, we heard great interest and genuine intention to undertake evaluations should the technical know-how be advanced and financial resources be available. We hope this research is used to support the cause.

### Study limitations

Although we are confident that our methodological approach allowed us to capture an accurate snapshot of KT activities at each agency, we caution that, because we did not interview all departments or branches of each agency, we cannot claim with absolute certainty that all KT activities have been identified.

The research reported in this manuscript has focused on the intentional efforts of funders to support KT. Focusing on the intentional may not have captured all KT activities supported. KT activities may go unreported when they have occurred as a part of a funding agency programme that is not intentionally supporting KT, particularly when they occur by decision of a grantee or awardee. For example, a researcher may decide to use a portion of a research grant to organise a meeting with hospital managers to discuss their findings; this activity has been technically supported by the funding agency with the grant, but it may not have been directed or recorded by the funding agency as KT support.

The longitudinal nature of the study design is weakened by the project team's inability to include seven of the agencies included in the t1 study [6]. An inability for the research team to establish a contact at a particular funding agency meant we removed the agency from the sample. We did not want to rely on data collected from the web and document reviews alone. We have no reason to believe this has introduced any bias into the study, neither could we identify any characteristic or quality that removed agencies have eliminated or reweighted in this sample vis-à-vis the 2008 sample.

A significant limitation stems from our sample of funding agencies being from high-income countries and focused on funding research that addresses high-income country needs. A review which includes low- and middle-income country funders was undertaken by Cordero et al. [25] as a companion to Tetroe et al. [6]. The follow-up to Cordero et al. [25] will be critical to understand the global story of funding agency support for KT[2].

A limitation in our study design relates to where we have focused attention in data collection and analysis. We have purposefully taken a broad view with this research, engaging 26 funding agencies from around the world in the study, allowing the identification of broad trends and themes for KT practice at research funding agencies. However, it does not facilitate the deep investigation of a particular funding agency's experience with KT.

We note, for reader interpretation, the timing between data collection and publication – data were collected from funding agencies for this project in 2012/13 (9 to 10 years after the data collection in t1). Readers' should interpret the findings accordingly.

## Conclusions

In summary, our research confirms that KT is an objective of growing significance for the health research funders across the high-income regions of Europe, Australia and North America. The findings demonstrate that there is no clear-cut standard or practice for implementing KT at a funding agency. We suggest that KT is an idiosyncratic matter that relies on the many contextual factors presented to a particular research funder. There is very likely no viable one-size-fits-all solution. We suggest that the diversity of experience this research has uncovered indicates that any sweeping conclusions or directives for KT at funding agencies should be handled with caution, and also calls for evaluation of KT in these different funder contexts to learn what works, for what type of funder and why.

We suggest that the critical evaluation of KT should be prioritised and actioned so that evidence-based decision-making becomes not only the objective of KT programmes, but also a part of how these programmes operate and evolve. These evaluations should take into consideration the particular context of the agency that undertakes the evaluation, and should make this context clear in order to facilitate other agencies' interpretation of the results. To kickstart and advance high-quality evaluation, we suggest funders support KT evaluation experimentation, innovation and collaboration among each other on the topic. Funders should not feel alone, this effort may well embrace the researcher community interested in doing and improving KT. As the significance of KT grows for funders, so must the evidence base to guide it.

## Endnotes

[1]There were many evaluations conducted by the research community through the CLARHC programme of the National Health Services – Service Delivery and Organization, we reference two examples. None of these evaluations focused on the activity of the funding agency in support of KT.

[2]This study is currently in design by authors: RKDM, JAV, IDG.

### Abbreviations

CAD: Canadian dollar; CIHR: Canadian Institutes of Health Research; IKT: Integrated Knowledge Translation; IRE: Intended, Realised, Emergent; KT: Knowledge Translation

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### Availability of data and materials

All data generated or analysed during this study are included in this published article.

### Authors' contributions

Conceived and designed the study: RKDM, IDG, JMT, JAV. Performed the study: RKDM, IDG, JMT. Analysed data and drafted the manuscript: RKDM. Wrote and revised the final manuscript: RKDM, IDG, JMT, JAV. All authors read and approved the final manuscript.

### Ethics approval and consent to participate

Ethics approval for this study was granted by the Ottawa Hospital Research Institute. All study participants consented to participation.

### Competing interests

Data collection for this study was undertaken while RKDM, IDG and JMT were affiliated to CIHR. All opinions presented in this manuscript belong to the authors alone, and not any institution to which they are or were affiliated. The authors declare that they have no competing interests.

## Publisher's Note



### Author details

[1]Faculty of Medicine and Health Sciences, Stellenbosch University, Tygerberg, South Africa. [2]Policy and Evaluation Division, International Development Research Centre, Ottawa, Canada. [3]School of Epidemiology and Public Health, University of Ottawa, Ottawa, Canada. [4]Centre for Practice Changing Research, Ottawa Hospital Research Institute, Ottawa, Canada. [5]Retired health researcher, Ottawa, Canada.

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# RESEARCH STREAM TWO

# *Scaling Science*

### *Context*

Research stream one identified a lack of evaluative evidence informing funders' support for KT. Research stream two moves to address these knowledge and practice gaps directly. It places specific focus on how research funders and researchers can generate the most meaningful impact from their work. This focus on 'scaling impact' – what I will argue is a supplement to KT – was driven by the specific knowledge needs of the engaged research-user for this stream of the dissertation, the International Development Research Centre.

The title of research stream two – *Scaling Science* – purposefully embraces a double meaning. First, it aims to support funders with scaling research results. Second, it aims to advance a systematic science of scaling. To support these joint aims, the following two chapters present the results of an empirical review of research projects supported by the International Development Research Centre. The results of this review include a set of evidence-based strategies for moving research into impact, and an action-oriented guide which contributes to building a systematic science of scaling.

### *Stream objective*

What strategies might optimize funders' support for KT and impact?

### *Stream research questions*

5. What pathways have been followed to translate research into meaningful real-world impacts? Can any such 'pathways to impact' be identified, described, and/or categorized?

6. What 'facilitating factors' have supported research while traveling these 'pathways to impact'? Can we identify, describe, categorize practical 'principles' for scaling impact?

**Chapter 5 –**

# *Scaling Science: Advancing Innovation for the Public Good*

**Summary**

This chapter introduces stream 2 of the dissertation, *Scaling Science*. It provides new evidence about how research can create meaningful impact for research funders and researchers. To implement the *Scaling Science* research stream, I used an IKT approach. The engaged research-user was the International Development Research Centre, a research funder. The study design included three phases. Phase 1 employed an environmental scan to contextualize the research, set study parameters, and sharpen study objectives. Phase 2 involved a two-step data collection and analysis strategy; where step one involved an inductive content analysis (multi-project reviews, n=200), and step two tested emerging results through deductive in-depth case studies (n=5) and international sense-making workshops with IDRC and its grantees. Phase 3 of the study focused on producing meaningful project reporting and communications. Key results include four guiding principles for scaling impact, a typology of pathways to impact at scale, and 5 deductively illustrative case studies of research scaling in action. The findings suggest that a notion of 'scaling' should be considered supplementary to KT. This provides an important conceptual contribution, and a starting place for advancing a science of scaling.

This chapter is structured to meet the Stellenbosch University guidelines for dissertation-by-publication, and presents a condensed summary of the research. The study was originally published as a peer-reviewed and open access academic book. The book format was purposefully selected in Phase 3 of the study to support uptake and impact. Readers of this chapter should consult*, Scaling Impact: Innovation for the Public Good* (McLean & Gargani 2019) for comprehensive detail.

**Role of the PhD candidate:** I authored this chapter as a summary of the original book, *Scaling Impact: Innovation for the Public Good* published by *Routledge* (McLean & Gargani 2019).

As first author of the book, I designed and directed the underlying study, I led study implementation, data collection and analysis, and drafting of the manuscript (including eliciting and facilitating input from the co-author and the engaged research-user team). I managed publisher submission, peer-review, and final preparation of the book including type-setting and graphic design to ensure an actionable and approachable research publication.

**Chapter 5 –**

# *Scaling Science:*

# *Advancing Innovation for the Public Good*

## 1. Introduction

Science and research can change the world. By many estimates, public investments in research and innovation are responsible for the majority of global social progress of the past 100 years (Lindner et al. 2015). A United States National Academy of Sciences-led review suggests that public research expenditures have reduced disease burden, increased lifespans, improved lifestyles, and created new jobs while reducing redundant work (USNAS 2007). A recent review conducted by the European Commission (2017) reaches similar positive conclusions about the potential of science to drive societal progress, and demonstrates how public investments in research have the capacity to generate economic returns far outweighing their cost. Although science and research can change the world, it is research *on* science that will govern the realization of these changes.

The International Development Research Centre (IDRC) is a Canadian-based science funder with an inherent interest in enhancing the social impact of the research it supports. Since 1970, IDRC has strived for social and environmental progress by supporting research conducted by, and largely intended for, Southern scientists. In 2015, IDRC launched a new strategic plan that made its ambition "to support impact at scale" a cornerstone of its vision for funding (IDRC 2015). Given the relatively new ground this laid, a concurrent learning objective was expressed in the same strategic plan, specifically: "IDRC will be recognized for sharing its learning in scaling up solutions" (IDRC 2015). Multiple efforts were launched to support this objective, from a strategic organizational evaluation to project-level monitoring measures.

It is against this backdrop that the *Scaling Science* research stream was born. It has been endorsed and supported by IDRC as a critical evaluative learning exercise, with an aim to unpack what "scaling impact" means for an organization that funds translational research across the Global South. As appointed project leader, I was able to connect my personal interests, professional experience, and academic expertise to the research (see my positionality declaration in chapter 1 for details, and section two of this chapter for details of the engaged-research approach). The name given to this research stream purposefully embodies its twin aims. On the one hand, *Scaling Science* describes the action of scaling the impact of research and innovation for the public good. On the other hand, it describes the pursuit of a critical and systematic science of scaling that may increase the likelihood of scaling efforts benefitting people and the environment.

The academic literature on innovation and research uptake has considered the topic of scaling across several disciplines. In the health sciences, the body of research is the richest, in particular within the domain of implementation science. Recent reviews and cross-sectional studies are building a detailed understanding of the concept of scaling-up (Milat et al. 2015; Ben Charif et al. 2017; & Greenhalgh and Papoutsi 2019) and application-oriented studies are working to move the theoretical towards practical implementation (WHO 2010; Milat et al. 2016; Milat et al. 2020; Ben Charif et al. 2018). In agricultural sciences, a special collection of theoretical and empirical articles in *Agricultural Systems* was recently curated and hosted on the journal website by Marc Schutt and colleagues (Agricultural Systems 2020). In technology and innovation, Open African Innovation Research (2020) have assembled a cross-continental report on scaling-up in African knowledge and innovation economies. In education, the Knowledge and Innovation Exchange (KIX) has identified 'scaling impact' as a critical pillar of its global strategy for improving education outcomes (Albright & Lebel 2020). These are just a few examples from a growing body of work on a topic of increasing importance across many disciplines of science.

Where this work adds novelty and nuance is in its entry point to the problem: the role of the research funder. This research stream contributes to the construction of an emerging concept of scaling with new empirical work, and subsequently, presents an evidence-based method for approaching scaling in theory and practice.

To interrogate the issue of funder support for scaling and impact, this study addresses two use-oriented research questions. These questions were co-developed with the engaged research-user, IDRC[2], and target immediate knowledge needs. Specifically:

1. *What pathways have been followed to translate research into meaningful real-world impacts? Can any such 'pathways to impact' be identified, described, and/or categorized?*

2. *What 'facilitating factors' have supported research while traveling these 'pathways to impact'? Can we identify, describe, categorize practical 'principles' for scaling impact?*

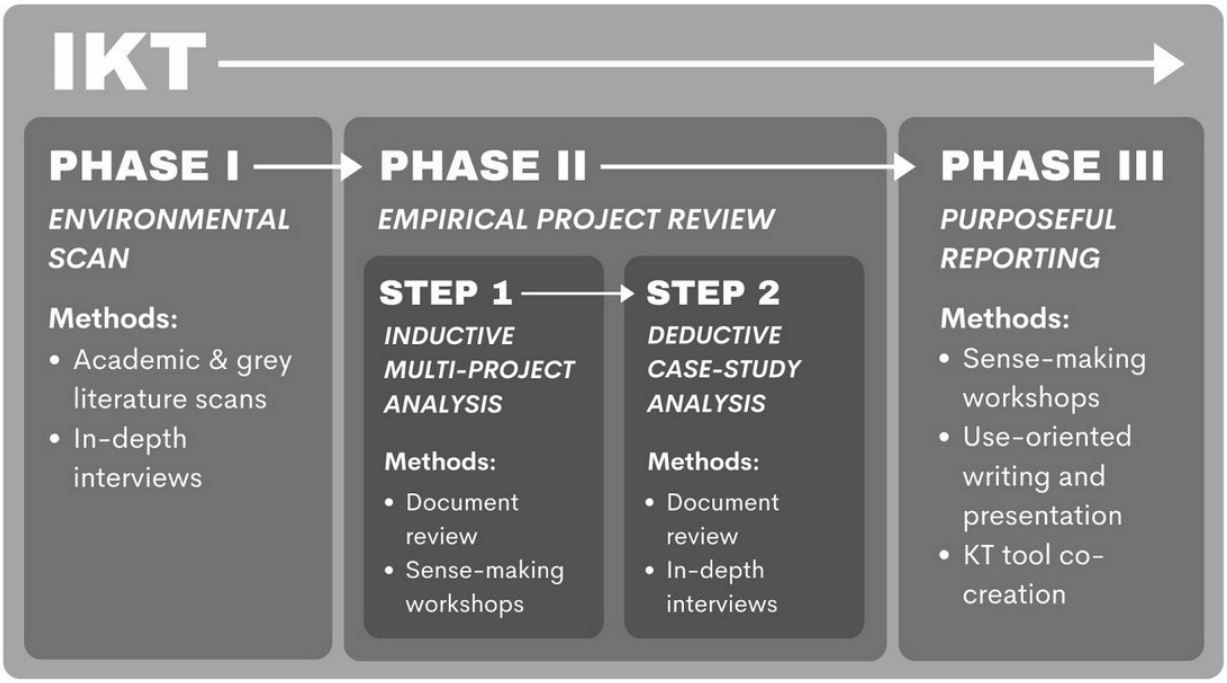
The following sections of this chapter outline the research methods, findings, and implications in turn. Further details on the study, its design and its results are available in the central output of the research stream, the open access book: *Scaling Impact: Innovation for the Public Good* (McLean & Gargani 2019).

[2] These represent research questions 5 & 6 of the dissertation.

## 2. Methods

The following section reports the overarching approach, study design, and methodology employed in the *Scaling Science* research stream. In short, the research was implemented using an Integrated Knowledge Translation approach over the course of a three-phase study design. Figure 1 provides an illustrative overview. The remainder of section 2 outlines the details. Undertaken as a research partnership with IDRC, ethics is provided via the Government of Canada's *Policy* and *Directive on Results* which governs Canadian Government initiated evaluation research.

**FIGURE 1** Study design




### 2.1. Overarching approach: Integrated Knowledge Translation

The research was conducted using an Integrated Knowledge Translation (IKT) approach. The IKT approach, sometimes known as 'co-production', is employed to increase the relevance and usability of the research results (Graham et al. 2014). To accomplish this, intended research-users are involved throughout the process of research design, study execution, interpretation, and reporting. In the *Scaling Science* research stream, the primary research-user was the International Development Research Centre (IDRC), a research funder with a vested interest in scaling research impact. Accordingly, IDRC was engaged through the full process as a research partner. A formal method of eliciting this engagement at planned points in the research process was the use of a reference group known as the Critical Friends. This group met with the researchers to actively participate in the study design, implementation, and interpretation of findings. These meetings were not employed as data collection opportunities where researchers studied the participants. They were moments of shared ownership and leadership over the research process. The

specific interactions with the Critical Friends are detailed in the following sub-sections. A secondary user of the research is IDRC's global research community. These secondary users – including researchers and like-minded organisations – were engaged over the course of the study to scope the study parameters and truth-check emergent findings.

#### 2.1.1. Primary User ('IKT engaged research-user')

At the outset, the project objectives and design were approved by the executive management committee of IDRC. This provided top-level support and endorsement for the research. In addition, IDRC staff from across IDRC's research programs were engaged in shaping the study from start to finish. This advisory group, under the name of '*Scaling Science* Critical Friends', was chaired by IDRC's Donor Partnerships Division, and acted as a cross-cutting IDRC functional group established to broaden study utility and interest. The group was made up of 8 IDRC staff, representing 8 IDRC research programs[3]. The Critical Friends met at each Phase of the project to discuss study design, data collection, data interpretation, and purposeful reporting.

#### 2.1.2. Secondary User

As identified secondary users of the research, findings were truth-checked with members of IDRC's research and funder partner communities. Events in our research community included field visits to three agencies in Buenos Aires, Argentina, working to scale policy impact for the reduction of non-communicable disease (NCD). The three agencies were Fundación InterAmericana del Corazón—Argentina (FIC), the Institute for Clinical Effectiveness and Health Policy (IECS), and Centro de Estudios de Estado e Sociedad (CEDES). Together, we elaborated on our study design and objectives, and unpacked emergent results. Both sides benefited immensely from the exchange of ideas and experiences. On two occasions, the *Scaling Science* study was formally presented and tabled for informal discussion with grantees, evaluators and researchers in South Asia—once in Kathmandu, Nepal and once in Thimphu, Bhutan. In addition, we hosted a special meeting on the topic of "*Scaling Impact*" at the American Evaluation Association Conference in Atlanta, Georgia. We discussed and debated emergent concepts with development partners, including DFID, USAID, the Rockefeller Foundation, and Oxfam GB, amongst others. The same session hosted IDRC grantees and opened the study to critical feedback from this group. During the session, we also received critical insight from academic leaders on the topic of scaling and research evaluation. A public report of this meeting was published and is available in open access (IDRC 2016).

### 2.2. Study design

The research was executed using a three-phase design. Phase 1 consisted of a preliminary scan of the internal and external environment. It focused on organizational practice and literature. The approach to

[3] At IDRC, a "research program" is an element of organizational architecture. It is an organizational working/funding unit, formed around a research theme, and made-up of staff with significant expertise in this domain. For example, the case study presented in Annex 3 was supported by IDRC's 'Food, Environment & Health research program'.

literature and document review utilised in this Phase is classified on Grant & Booth's 2009 typology of reviews as a 'Critical Review'. It did not follow the methodology of a systematic review as per Cochrane or Campbell collaborative guidelines. Neither was it intended to be registered, implemented, or reported, as such. The aim was to clarify research parameters and objectives, and to inform the subsequent data collection, analysis, and reporting strategies. Phase 2 initiated empirical review, analysis and data interpretation. It was split into two intentionally staggered steps: Step 1 - an inductive multi-project review, and Step 2 – a deductive case study analysis. The aim was to gather, interpret, and appraise data that could provide robust and actionable responses to the research questions. Phase 3 focused on meaningfully communicating research results with intended audiences. Each Phase was implemented using the IKT approach to engaging primary and secondary research users as described in 2.1 above.

**PHASE I**

***ENVIRONMENTAL SCAN***

Phase 1 involved an internal and external scan of the state of practice in scaling research impact. This scan included three purposefully concurrent processes:

1. Literature review (academic and organisational grey literature)

The academic literature review was conducted using a researcher developed keyword list, and searches across publicly accessible databases, including Google Scholar, PubMed, and the IDRC Digital Library. The review strategy was fit to the criteria of a "Critical Review" as classified by Grant & Booth 2009. Grant & Booth describe the Critical Review approach across elements of 'search', 'appraisal', 'synthesis', and 'typical result' as follows. In terms of its search strategy, a Critical Review: "seeks to identify most significant items in the field". In terms of literature appraisal, a Critical Review attempts: "no formal quality assessment. Rather, attempts to evaluate according to contribution". In terms of synthesis strategy, a Critical Review is: "typically narrative, perhaps conceptual or chronological". In terms of results, the Critical Review: "typically results in a hypothesis or model" (Grant & Booth 2009).

Accordingly, the review was not designed to achieve a conclusion on a research question or to synthesize the results of multiple studies. Then too, the search strategy was not systematized around set terms as in a systematic review, but instead, followed a strategy of reference snowballing and user-question driven search, identification, collection, and retention of materials for review. The aim was to draw a general understanding of the current state of knowledge on the topic of scaling for the intended user, saturation was determined by consultation between the user and the researcher, and the aim was to assist in framing research questions appropriate for IDRC (Grant & Booth 2009). These questions are detailed in sub-section 3 below.

Specifically, articles were collected, sorted, and reviewed by two research team members. Grey literature was collected using the Google search engine and the same keyword list. The grey literature collected through initial searches was supplemented with organisations and organisational reports of interest,

recommended during internal and external interviews. In sum, we collected and reviewed multiple academic and organizational reports of varying publication type (n ≈ 40) at this stage of the research. The results were not published, or submitted for publication, as a 'Critical Review' manuscript.

2. In-depth interviews with IDRC staff

Interviewees at IDRC were identified by the researcher in consultation with IDRC executive management who were interviewed first by census. A semi-structured interview guide was developed by the researchers and used to structure each interview. It was tested in the executive interviews and, given its success, replicated in the remaining staff interviews. Interviews were conducted in person, or by Skype, and lasted between 60 and 90 minutes. Interview notes were transcribed by the interviewer and analysed by both members of the research team in a deliberative process as interviews progressed. The aim was to identify key areas for developing research questions and research scope.

3. In-depth interviews with an international sample of scaling experts and development agencies

External interviewees were identified by IDRC executives and through the literature review. A final list of interviewees was selected by the researchers and interviews were conducted using Skype. Interviews lasted from 30 to 90 minutes depending on the expertise and availability of the external informant. A tailored version of the internally tested interview guide was used to structure the discussion. Interviews notes were transcribed by the researcher during and immediately following the scheduled interview. The research team met at weekly intervals to assess methodological strength of the approach and emergent learning from the interviews.

The overarching aim of the Phase 1 environmental scan was to contextualise and refine study parameters and questions. It did not result in a publication or report, nor was this the objective. Instead, the scan helped us to understand key areas of need for IDRC as identified by its own staff, and to identify key areas where IDRC could contribute to the broad state of knowledge on scaling. To reach this outcome, two meetings of the Critical Friends group were held, during which emergent results were presented by the researchers, and ensuing discussions highlighted key themes and areas of interest. Following these deliberative discussions, a third meeting was hosted where the internal and external scans culminated in the drafting of the *Scaling Science* research objective and questions.

Chapter 1 of this dissertation positions the objectives and questions within the context of the full dissertation. The specific research questions related to the *Scaling Science* research stream are:

1. *What pathways have been followed to translate research into meaningful real-world impacts? Can any such 'pathways to impact' be identified, described, and/or categorized?*

2. *What 'facilitating factors' have supported research while traveling these 'pathways to impact'? Can we identify, describe, categorize practical 'principles' for scaling impact?*

These questions set a clear course for entering Phase 2 data collection, analysis and interpretation.

**PHASE II**

***EMPIRICAL PROJECT REVIEW***

Empirical review was completed using a staggered two-step approach to critically examine IDRC-supported research. The mixed-methods, stepwise approach has been aligned with recommended practice in qualitative research (Kyngas 2020; Kyngas & Kaakinen 2020; Mikkonen & Kyngas 2020).

In Step 1, a broad scan of IDRC projects was conducted to inductively identify trends, consistencies, and anomalies in research scaling. The pathways and mechanisms of change (i.e., the typology of *pathways to scale* and the four guiding principles) were first conceptualised through this process. Methodologically speaking, this part of the research protocol was inductive, as we aimed to identify and document trends and anomalies in the data (Creswell & Clark 2017).

In Step 2, five innovations were selected as case studies and deconstructed in significant detail using interviews, site-visits, and project documentation review. Pathways and guiding principles developed in the first stage were deductively tested across very different research contexts, scenarios of *scaling impact*, and mechanisms of IDRC support. Methodologically speaking, Step 2 was deductive, as we aimed to test emergent findings against detailed scaling experiences (Creswell & Clark 2017).

**STEP 1**

***INDUCTIVE MULTI-PROJECT ANALYSIS***

The inductive content analysis comprised a retrospective analysis of n=200 IDRC-funded research projects. To select the projects for analysis, and ensure thematic coverage of IDRC research, a sampling frame was created using IDRC's eight research programs for stratification. Using this frame, the sample was drawn randomly from projects completed between 2010 and 2015, with equal numbers for each program grouping. The analysis took the form of a desk-based, multi-party review of official project documentation. We systematically reviewed common, and therefore comparable documents for each project. These were: the Project Approval Report, the Project Monitoring Report, and the Project Completion Report.

Through this document analysis, projects were further classified using four descriptive criteria: global region(s), topic of research, time length of study, and type of study design. With this categorized dataset compiled, a landscape of projects could be observed and further analysed. Accordingly, a second set of criteria for stratifying the projects was co-developed with the Critical Friends group and applied. These criteria aimed to more adequately focus on the issue of *scaling impact*. They included: 1) having an explicit scaling strategy, 2) having achieved impacts at scale, or demonstrated the potential to do so, and 3) having designated value identified by the Critical Friends group[4]. With these criteria established, the sampled projects were analysed by three independent reviewers to identify cross-project trends. When reviewer

[4] This variable was constructed by asking Critical Friends to highlight the projects of particular interest or perceived value on the grounds of topical relevance, alignment to current strategy, type of grant recipient, prospective work of a similar nature.

discrepancies were observed, the disputed projects were set aside for a consensus meeting and discussion to reach a final categorization.

The inductive and methodical review was designed to respond to research questions, by identifying 'how impact was being generated' (Q1) and examining mechanisms that 'enabled and/or inhibited scaling' (Q2). The key themes and concepts that emerged were classified by researchers and grouped into correlative thematic categories which formed the basis for further analysis. This analysis of emergent trends was brought to the Critical Friends advisory group to ground-check relevance and dialectically interpret meaning and framing. To further the validation of this inductive content analysis and emerging thematic categories, a rigorous deductive testing was the key purpose of Step 2.

***STEP 2***

***DEDUCTIVE ANALYSIS WITH IN-DEPTH CASE STUDIES***

Following the multi-project review, a shortlist of experiences was generated for deductive case study analysis. This shortlisting was conducted iteratively with the Critical Friends in order to diversify perspective and expertise, and to benefit from the dialectic process multi-party review. Criteria for shortlisting were the two thematic categories that had emerged in the inductive content analysis described in Step 1, namely, pathways to impact at scale and the emerging 'enabling factors for scaling' (later to be framed as 'guiding principles'). Twenty cases with prevalent incidence of the 'enabling factors' were selected by the research team, and the 'pathways' were used as stratification criteria to cross-examine the set. The twenty cases were reduced to 5 based on coverage of the 'pathways' criteria, diversity of research thematic areas covered, and perceived learning value to the Critical Friends group of IDRC research funding staff. Co-review and co-selection with the Critical Friends also helped to address research feasibility concerns. Via a consensus process with the Critical Friends and final discussion with the IDRC programme officer responsible for each project, we shortlisted the sample to the following five cases:

1. Scaling Ecohealth for Chagas disease prevention in Central America
2. Scaling a nutrition intervention using markets and e-vouchers in Tanzania
3. Scaling salt reduction policies and programmes in Latin America
4. Scaling Southern policy research to a global level: Southern Voice
5. Scaling access to justice for survivors of sexual violence

Annex 1 provides a crosswalk of the five cases, noting selection criteria for each case (including the relevant 'pathway to scale'). Annex 2 provides short illustrations of four of the cases and outlines how they navigated the pathway to scale. Annex 3 presents a narrative report of number 1 on this list. The aim of the case study analysis was not to interrogate or showcase the strongest examples of scaling success, but to ensure a multi-disciplinary, thematically cross-cutting, and rich deductive investigation of how scaling in research and innovation may take shape.

From this sample, case study analysis was grounded in a common approach to data collection, analysis, and reporting. A systematic approach to case study analysis aimed to ensure that a comparable and

contrasting analysis was conducted for each of the cases. Again, the primary objective of the case study research was deductive content analysis, whereby the thematic categories identified in Step 1 could be tested for relevance across five scaling impact experiences (Kyngas & Kaakinen 2020).

The deductive case studies involved two main data collection activities:

1. A review of the full set of documentation related to the case, including IDRC documentation about the project and the innovators' research outputs and results. This provided background information on each case. It also provided a formal capture of initial scaling goals, processes, and results.
2. Semi-structured, in-depth interviews with key stakeholders for the case: focusing primarily on the scaling system actors related to the project (n = 3 to 8 per case). These included: IDRC staff; the 'principal investigator' for the project(s) in the case; other research leads as necessary; and innovation stakeholders. Interviewees were selected by recommendation of the IDRC responsible project officer and nominated principal investigator, and by snowballing method thereafter. These interviews were conducted with a consistent, though flexible, semi-structured interview guide and lasted between 60 and 90 minutes per interview.

Additionally, site-visits were utilized for 2 of the 5 cases (3 & 5 on the list). For these cases, site-visits broadened the interview and document sample/analysis and allowed deeply meaningful feedback from project leaders and scaling system actors. This opportunity for two-way exchange enriched our understanding of emerging scaling concepts and thematic categories, as well as the narrative surrounding the particular case.

The interviews and document reviews were performed iteratively, meaning both processes informed the progress and saturation point of the other. Saturation was determined when new sources or themes were no longer emerging from the data.

Each case was analysed in relation to the thematic categories that had been identified in Step 1; namely, the typology of 'pathways to scale' and the 'enabling factors'. The consistent use of these thematic categories provided an opportunity for a collective case study analysis, and informed our understanding of the scaling experience of these diverse sets of researchers and scaling experiences. Importantly, it also facilitated a feedback loop, where key stakeholder responses to, and critique of, the emergent pathways to scale and guiding principle framework could unfold.

**PHASE III**

***PURPOSEFUL REPORTING***

In line with the IKT research approach, we worked in concert with the Critical Friends group to develop a use-oriented research reporting strategy. As such, findings of this study were not immediately sent for academic peer-review and cataloguing in journals. Instead, they were peer-reviewed, debated and co-developed by/with intended study users: IDRC and its broader research community.

An additional, novel step in the research reporting processes involved the conversion of identified 'enabling factors' into the more approachable format of 'guiding principles'. The aim of doing so was to support study uptake and impact with the intended research-user. To do so, two sense-making workshops of the Critical Friends were held on the topic. During these sessions, data from Phase 2 was co-examined against researcher-developed iterations of the principles and the diverse experiences of the Critical Friends group. During each formal meeting of the Critical Friends group (Phase II & III inclusive), notes were transcribed by the research team and participant review was elicited and incorporated. Following this, we published an internal IDRC report and gave several open presentations to staff to elicit feedback. In addition, international meetings were held, introducing and discussing early versions of the principles (see 2.1.2 above). Concurrently, we benefited from the guidance of Patton 2017 and CCGHR 2015 and their respective experience developing principles for organisations and health researchers.

Broader plans for research outputs were deliberated and prioritized during a focused working meeting of the Critical Friends group. Resultant reporting has included custom-built videos, technical and non-technical presentations, technical articles and plain language blogs, a peer-reviewed open access book, and an action-oriented guidebook for researchers (see chapter 6).

## 3. Findings

Findings of the research are presented in the following subsections. Section 3.1. begins with an overview of study participation at each study Phase. Sections 3.2 and 3.3 present key results vis-à-vis the research questions. These are reported in two discrete sub-sections in an attempt to clearly communicate complex concepts against each separate research question. In actuality, these concepts are not discrete, but inexorably linked. The central results are: 1) a typology of pathways to scale and corresponding navigation strategies, and, 2) four guiding principles for scaling impact. The interconnection between the two is elaborated in section 4.

### 3.1. Study participation

Table 1 provides an overview of study participation at each Phase. General groupings are used to show stakeholder roles in relation to the research and anonymize identities of individuals. Numbers of individuals engaged, per method and per stakeholder group, are provided.

**TABLE 1** Study Participation

| ***Study Phase*** | | ***Stakeholder Type*** | ***n*** |
|---|---|---|---|
| **Phase 1**<br>*Environmental scan* | | IDRC executive management | 5 |
| | | IDRC Staff | 10 |
| | | External academic experts on scaling | 4 |
| | | External research and development funders | 8 |
| | | IDRC 'Critical Friends' sense-making (*3 meetings*) | 8 |
| **Phase 2**<br>*Empirical project review* | **Step 1**<br>*Sense-making workshops* | IDRC 'Critical Friends' sense-making (*2 meetings*) | 8 |
| | **Step 2**<br>*Case study interviews* | Researchers | 12 |
| | | Scaling system actors related to the case study | 18 |
| | | IDRC responsible project officer | 5 |
| **Phase 3**<br>*Purposeful reporting* | | IDRC Critical Friends sense-making (*1 meeting*) | 8 |
| | | IDRC staff | ≈ 30 - 40 |
| | | External researcher and development community | ≈ 30 - 50 |

### 3.2. A typology of *pathways to scale*

Stratification of the project sample in Phase 2, Step 1 of the research process allowed for the designated criteria to be analyzed and compared across multiple projects. A result was the identification of five fluid categories of operationalising research and innovation for impact. These *pathways to scale* were used as decision criteria for selecting the subsequent case studies (see Table 2) and ensuring the coverage of the analysis. A case study narrative report is offered in Annex 3 of this chapter. All five case studies are illustrated comprehensively in Chapters 7 through 11 of the *Scaling Impact* book (McLean & Gargani 2019).

**TABLE 2** Five *pathways to scale*

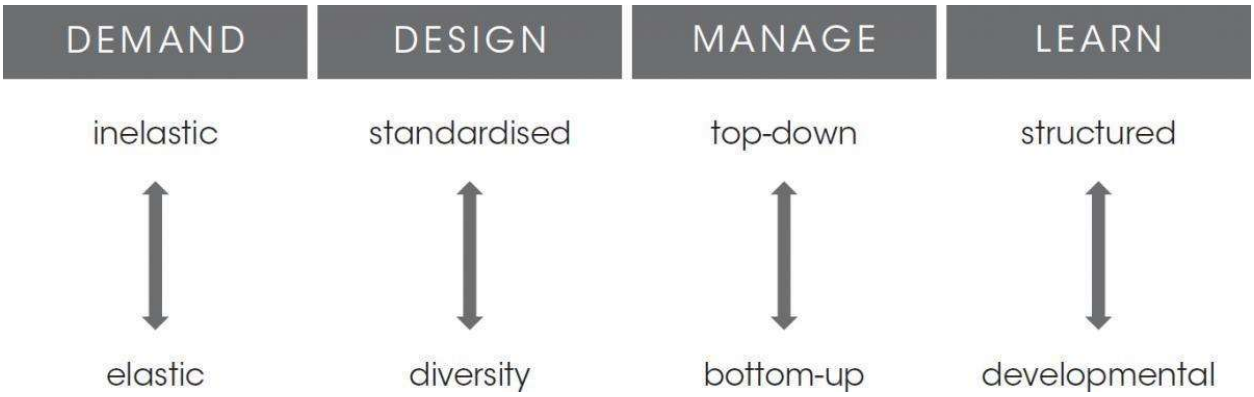
| ***Pathway to scale*** | ***How does scaling happen?*** |
|---|---|
| **Policy**<br><br>An evidence-informed policy is adopted and implemented for a given place, sector, or jurisdiction to support the public good. | → Evidence is used to inform a new policy or change an existing policy<br>→ Evidence influences replication and/or adaptation of a policy to a new jurisdiction or system<br>→ Evidence informs the expanded application of an existing policy |
| **Programme**<br><br>An evidence-informed programme, offering a set of goods or services, provides value to a group of participants or beneficiaries. | → A novel programme is designed and implemented with evidence for an identified group or need<br>→ Evidence informs the replication and/or adaptation of a programme in a new setting or for a specific group of users<br>→ Expansion of programme catchment with evidence<br>→ Quality improvement of an existing programme is informed with evidence<br>→ Partnerships are formed for the growth, development, and/or improvement of services offered by a programme |
| **Behaviour, practice, and skill**<br><br>An evidence-informed behaviour, practice, or skill, simply described as an action or grouping of actions, is adopted and commonly applied to contribute to the public good. | → Behaviour change interventions: formal, such as laws, and informal, such as awareness campaigns, are designed, implemented, improved, and expanded with evidence<br>→ Guideline creation to outline practice standards based on evidence<br>→ Learning and training interventions to teach new skills or improve pre-existing ones |

| | |
|---|---|
| **Product and technology**<br><br>A product or technology, whether distributed publicly or privately, is used/consumed/embedded, which, in turn, contributes to development. | → Commercialisation and market access research<br>→ Public systems and actors utilised to spread the distribution of a good<br>→ An existing good is improved, pivoted, or made more accessible or distributable with evidence<br>→ The value-chain underpinning a product or technology is improved with evidence |
| **Methodology**<br><br>A way of knowing and/or doing is strategically adopted and used to generate social impact. | → Publication/sharing of new concepts and ideas or improvement on existing methods<br>→ Inter-, multi-, trans-disciplinary interchange<br>→ Participation processes for users and stakeholders<br>→ Advocacy for increased use of research and evidence<br>→ Leadership and capacity strengthening to undertake and apply research and innovation |

### 3.2.1. Navigating pathways to scale

Navigation approaches help a researcher to name trade-offs and decision points faced while moving along the above pathways to scale. Figure 2 illustrates typical focus points researchers face along a pathway to scale. These are: Demand (how desirable the research is with intended beneficiaries), Design (how research is framed and positioned in context), Manage (how a project is implemented), Learning (how a project adapts and changes). These are typical 'stages' during a project that require researcher attention when scaling impact via any of the 5 pathways to scale. At the same time, Figure 2 introduces the observed concept of trade-offs to each of the focus points. It is a consistent finding of the multi-project review, and the in-depth case studies, that pathways to scale are laden with trade-offs requiring careful attention and navigation. Figure 2 introduces a commonly observed trade-off of "flexibility" in the research.

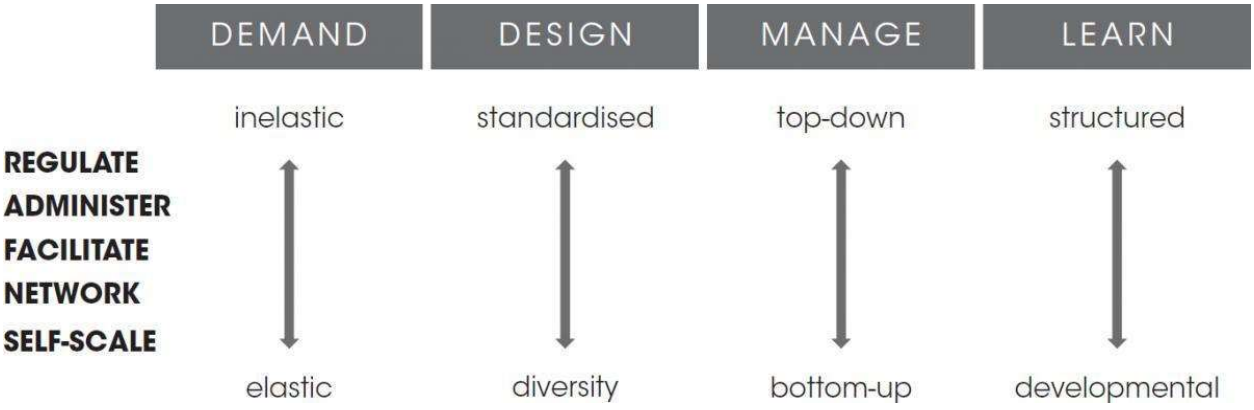
**FIGURE 2** A spectrum of 'flexibility' trade-offs along a pathway to scale




Source: McLean & Gargani 2019

Next, in the leftmost of Figure 3, the concept of 'navigation approaches' is introduced to the model. Navigation approaches are commonly observed strategies researchers used to address the complexity of the trade-off and steer their research toward desirable impacts in their context. Refer to Annex 2 for practical examples identified throughout the case studies which bring these findings to light.

**FIGURE 3** A spectrum of navigation approaches for trade-offs along a pathway to scale




Source: McLean & Gargani 2019

In sum, the identified pathways to scale provide a thematic category for grouping and describing scaling impact journeys. However, they do not represent static routings. They require discretion and flexibility as they are travelled. Navigation approaches offer ways of dealing with trade-offs that are faced along a pathway to scale, but how decisions about these trade-offs are made will ultimately rely on values and vision of the researcher and research.

### 3.3. Four guiding principles for scaling impact

The research uncovered a series of enabling factors for scaling impact. These findings were inductively identified in the multi-project review, deductively tested in the 5 case studies, and further refined and co-developed through the IKT approach which underpins the entire research project. They are presented in the format of four guiding principles for scaling impact for the public good. Table 3 below outlines the four guiding principles and their key components. Annex 3 provides a detailed narrative of the principles in action, through a case study example.

**TABLE 3** Four guiding principles for scaling the impact of research

| ***Guiding Principle*** | ***Components*** |
|---|---|
| **Guiding Principle 1:**<br><br>**JUSTIFICATION**<br><br>Justification encourages the governance of scaling for, and by, those who will be impacted. | **1. Scaling is a choice that must be justified.**<br><br>In the contemporary landscape of research funding, scaling has become an imperative. Innovators are pushed to achieve impacts that are transformative, sustainable, or profitable in a short span of time because this demonstrates success and value. In response, they may rush to scale their work, believing they have no choice because their financial support will be withdrawn otherwise. But researchers do have a choice, and sometimes it is better not to scale. Unless researchers can approach scaling as a choice, they are more likely to impose unwarranted impact risk. |
| | **2. The choice to scale is made by the balance of evidence alongside values.**<br><br>Credible evidence of impact (or propensity of impact) matters. It reveals what an innovation *can* influence and affect. However, the decision to scale is not based solely on evidence, it also rests upon the values of those affected. Values tell us what people believe *should* be changed. The values people hold give shape to their desires and interests, and they influence what people perceive to be a problem, the urgency with which it must be solved, and the merit of competing solutions. Values also determine the extent to which the interests and desires of others matter, and whether people are willing to forgo some portion of benefit for themselves in order to increase that of another. In the end, people use evidence to judge whether scaling advances their values and achieves what they believe is right. From this perspective, *scaling impact* is a value-laden objective. |

| | |
|---|---|
| | When scaling considers values alongside evidence, it is more likely to create welcome change. |
| | **3. The choice to scale is shared.**<br><br>Researchers, funders, and others who scale an innovation are stakeholders, as are the people impacted directly and indirectly by the research. All have an equal right to realise its potential benefits and avoid its potential harm. However, the latter group bears the majority share of impact risk. Their stake in the research can be profound, in some cases a matter of life and death, and they should share in the decision to scale. There are many ways for them to take part, some more appropriate than others given the context and circumstances. When done well, impact risk is not imposed but agreed. In the absence of shared decisions, researchers and funders may be unduly influenced by the benefits scaling presents for them over the risks it imposes on others. |
| **Guiding Principle 2:**<br><br>**OPTIMAL SCALE**<br><br>Scaling implies trade-offs. The search for optimal impact – rather than maximum impact – governs scaling toward balanced and judicious results. | **1. More is not necessarily better.**<br><br>If the decision to scale has been adequately justified, judicious scaling still requires deliberation. To do this, those involved in scaling must think quantitatively and qualitatively, and receive a wide endorsement for how progress, failure, and success will be judged. Small and beautiful or big and flawed—both can be optimal under different conditions. |
| | **2. Scaling produces a collection of impacts.**<br><br>Rarely does scaling create only 'the impact' declared in the ultimate or final outcome of a log frame or logic model. Scaling generates a collection of impacts that will present a mix of benefits and costs to intended and unintended stakeholders in a scaling process. Aiming for *Optimal Scale* encourages those involved in a scaling process to consider the full spectrum. This includes the intended, unintended, desirable, and undesirable changes that scaling may induce. |
| | **3. Impact at optimal scale balances the magnitude, variety, sustainability, and equity of impacts in ways stakeholders endorse.**<br><br>Considering four dimensions of impact (magnitude, variety, sustainability, and equity) encourages a mindset that stretches over space, time, and within the granularity of a problem space. *Optimal Scale* implies these |

| | |
|---|---|
| | components, and the trade-offs that can arise between them, are named and considered. |
| **Guiding Principle 3:**<br><br>**COORDINATION**<br><br>Scaling for the public good rests on a dynamic mix of relationships. Coordination encourages designing, engaging, and adapting within this system. | **1. Scaling takes place in complex systems.**<br><br>The scaling system is the setting in which scaling takes place. At the centre of the system is the scaling process, which affects and is affected by various stakeholders (people, places, and things). For example: 'people' can be stakeholders when they play the role of a partner or gatekeeper; 'places' can be stakeholders when jurisdictions or built environments influence scaling; and, 'things' such as institutions, culture, markets, or gender norms can also affect scaling efforts. Each of these stakeholders can play different roles, which are not mutually exclusive. Initiators make it possible to start a subsequent stage of the scaling process. Enablers implement or support the scaling within and across stages. Competitors offer alternatives that may be better or worse. And the impacted are the stakeholders affected when the innovation is scaled. |
| | **2. Complexity requires a flexible scaling process.**<br><br>The scaling process is composed of overlapping actions. The initiation of subsequent actions is contingent on meeting co-constructed starting criteria. The arrangement and nature are contingent on what is learned as we scale. Consequently, the scaling process must remain flexible. |
| | **3. Coordination connects an evolving set of actors to the scaling process.**<br><br>Those engaged in a scaling process change while scaling happens. Different expertise, resources, and capabilities are required at each stage of the process. Those directing the process have a responsibility to recruit others to the process as needed and connect them with the current set of actors. |
| **Guiding Principle 4:**<br><br>**DYNAMIC** | **1. Scaling is an intervention that can be evaluated.**<br><br>*Dynamic Evaluation* aims to measure the collection of impacts of scaling as an intervention. Not just the impacts of the innovation at a single level of scale. It can use a collection of tailored learning strategies to examine how scaling transforms a holistic concept of impacts—assessing the magnitude, variety, equity, and sustainability of change. |

| | |
|---|---|
| **EVALUATION**<br><br>*Dynamic Evaluation encourages that learning underpins scaling from start to finish.* | **2. Scaling generates dynamic change, which necessitates similarly dynamic evaluation.**<br><br>Unlike traditional evaluation methods such as a "randomised control trial", "ethnographic case-study analysis", or "rapid impact assessment", *Dynamic Evaluation* is fluid. Standard evaluation approaches will provide helpful, scientifically rigorous knowledge about an intervention. But scaling causes shifts, and this must include an evaluative focus looking directly at these shifts. *Dynamic Evaluation* might incorporate a randomised trial or multi-year ethnography. But when conditions change, so too should the evaluation plan. It accepts shifting conditions and goalposts and works to adjust learning strategies to match these changes in conditions. |
| | **3. Dynamic Evaluation is a stance that is held before, during, and after scaling.**<br><br>*Dynamic Evaluation* is not viewed as the last step of the plan-do-review learning cycle. Neither is it the first step or the middle point. Rather, it is a body of tools for rounding rapid learning cycles that can be used strategically before, during, and after scaling. It relies on the judgment of identified and unidentified stakeholders who are active in the scaling system, including: initiators, enablers, competitors, and those impacted. |

# 4. Discussion

## 4.1. Governing the complexity of scaling impact

The findings presented in the previous section are grouped into thematic categories which are interrelated and mutually reinforcing: pathways and guiding principles. These findings hold promise for research funders in at least two regards. For one, they provide an actionable and approachable set of concepts that funders can implement, test, and improve upon. For another, they offer an alternative means of managing research and innovation programs which can help to avoid the traps and shortcomings of the predominant Results-Based Management (RBM) traditions.

First, guiding principles offer unique value to both primary and secondary research-user groups. They provide an approachable format of communicating and sharing evidence that users can immediately put to work. The primary research user, IDRC, has been able to make immediate use of the guiding principles as a conceptual framework in a current organization-wide evaluation of scaling efforts (IDRC 2020). Moreover, reporting the results in the form of principles and pathways increases their potential for application in diverse research and funding contexts – allowing those with the most intimate knowledge to innovate in their own setting.

Second, the thematic categories present a new frame of reference for research program and portfolio management and oversight. That is to say, pathways and guiding principles offer a novel alternative or supplement to conventional means of managing results currently established at most research funding agencies (McLean & Gargani 2019). These management approaches emphasise the interest of the funder while concealing the people affected. Most plot 'logical' flows of expected results from *few* to *many*. Universally based on linear, logical planning, they often overlook the complexity of dynamic settings[5]. By focusing instead on strategy, values, and vision, the guiding principles connect individual actions to a shared goal: impact at optimal scale. We do not suggest replacing RBM-style management approaches altogether; rather, we encourage complementary experimentation using the findings of this research.

## 4.2. Scaling as a supplement to knowledge translation

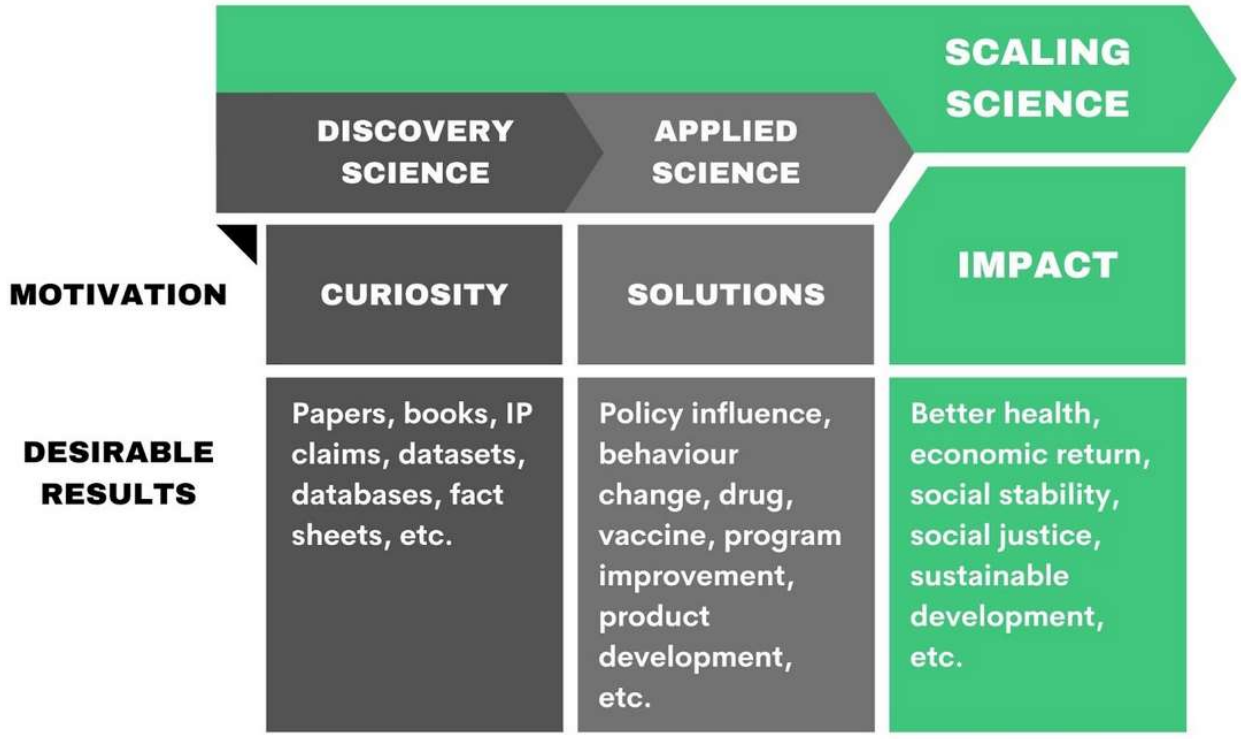
As discussed in section 4.1 above, the *Scaling Science* research stream has provided new and practical categories for scaling impact. The higher-level implication of the research stream is the contribution it makes to the interdisciplinary conceptual model of KT. We argue that 'scaling' offers a *supplementary* addition to KT. In short, KT is concerned with the application of knowledge, whereas scaling is concerned with optimizing the impacts of these applications.

In our view, this pushes researchers to consider the benefits of knowledge beyond uptake and application by immediate users, requiring them to position their work for the downstream opportunities for impact.

[5] For a few examples of these important, but at times restrictive, approaches to planning, design, and management see: logic models, logframes, and the results-based management (RBM) frameworks that embed them. These instruments are at the front lines of programme design, implementation, and evaluation. They offer much value under certain circumstances, especially when planning for results at a static level of scale. Further iterations common in development can include theories of change, pay-for-performance strategies, and/or deliverology.

Figure 4 illustrates how scaling science might build upon the existing paradigms of discovery and applied science.

**FIGURE 4** Scaling Science as a supplement to discovery and applied science




Both discovery and applied scientists can benefit by embracing scaling thinking just as they can KT. However, impacts are not always directly aligned or positively correlated, and often require a justified balance. For example, economic return may not always be aligned with optimal health outcomes for people. The *Scaling Science* principles help to prioritize those who are directly affected by scaling decisions and potential trade-offs. It is a strategy for optimizing research impact for the public good, not necessarily intended to support the pursuit of private gain. For public funders and philanthropies with public aims, thinking through how we *justify, coordinate,* and *dynamically evaluate* the *optimal impacts* of research is a unique contribution. *The Scaling Playbook* presented in the next chapter of this dissertation puts these principles into practice, and deserves further testing and evaluation.

### 4.3. Limitations and strengths

Several identifiable limitations of this research warrant consideration when interpreting results and their generalizability, though none undermine the importance and/or validity of the results. A first limitation relates to external generalizability. It is important to note that the research was conducted as a single funder case study, and all data – inductively and deductively collected – was derived from the experience of IDRC-funded researchers. This is a limitation, not a study shortcoming, as this was a purposeful research design consideration intended to increase internal validity with the primary intended research user.

Nevertheless, to mitigate, we have aimed to socialize and deliberate the results with multiple funders and actors outside of IDRC throughout the study. Ongoing external socialization will generate feedback from interested implementers, all while platforms are being established to formalize this process with funders and researchers outside IDRC.

A second limitation of the study relates to our difficulty in capturing and thus examining the full 'scaling experience' during the multi-project review. Although the project offers a useful entry point to scaling, it does not give a complete story of the full experience. To mitigate, this limitation is clearly reported. It is detailed in the description of the guiding principle of Coordination above, exemplified in the case study in Annex 3, and explored in depth in the Coordination discussion (chapter 5) of the book: McLean & Gargani 2019. Also, during each of the Phase 2, Step 2 case studies, we broadened our investigative lens to include scaling systems issues extending well beyond the 'project unit' analysis (see Annex 3).

Strengths of the research can be attributed to the IKT approach, which substantially enriched the research from start to finish. More specifically, from the very outset, research questions were aimed at precise user needs and practice gaps expressly because research-users helped to craft them. During study execution, the data collection and data interpretation were enhanced by the insight, perspectives, and experiences of the engaged Critical Friends group. Finally, uptake of the research into practice and policy action was apposite, economical, and expedient because research-users were anticipating results and were making space for their application well before final publication. In sum, the IKT process of the research facilitated an inclusive, rigorous, and useful research effort.

## 5. Conclusion

In summary, this chapter outlines the high-level design and ensuing results of the *Scaling Science* research stream. It provides an account of these results tailored for a PhD dissertation chapter. Readers of this chapter wanting to learn more should consult comprehensive study details in the book *Scaling Impact: Innovation for the Public Good* (McLean & Gargani 2019).

This research has generated evidence-informed thematic categories which help solve the perennial challenge of converting research into impacts that matter. Specifically, these include a typology of pathways to scale—along with a set of navigation approaches for travelling them—and four guiding principles for scaling impact. Each holds imminent potential for uptake and application. For one example, chapter 6 of this dissertation draws these results into a guidebook for researchers wanting to model scaling thinking into their research projects. At a higher level, the research provides an important conceptual contribution, and a starting place for advancing a science of scaling.

Having been co-produced with a research funder, the results are uniquely rich. Few other entry points would offer such a diverse, global, and multi-disciplinary perspective on the challenge of scaling impact. Moreover, the co-production approach applied throughout the research expanded the frame of reference, and precipitated relevant and immediately useful results. Finally, the findings fill a critical knowledge and practice gap. As outlined in the previous chapters of this dissertation, the funder's role in stewarding research impact is a critically understudied area. Ergo, the primary research-user, IDRC, is currently putting the principles and pathways into practice in an organization-wide evaluation of scaling research impact (IDRC 2020). Moving forward, the results may prove useful for other funders with similar learning and improvement objectives, once accorded appropriate contextual tailoring.

When travelling any pathway to scale, the four guiding principles illuminate a strategy whereby research impacts manifest as progress for the public good. In conclusion, scaling impact is a *coordinated* effort to achieve a collection of impacts at *optimal scale* that occurs if it is both morally *justified* and warranted by the *dynamic evaluation* of evidence.

## Annex 1 - Overview of five case studies

| *Case title* | *IDRC programme* | *Geographic area* | *Pathway(s) to scale* | *Additional criteria of interest* |
|---|---|---|---|---|
| Sexual and Domestic Violence: Policy Protocols<br><br>Sexual Violence and Impunity in South Asia | Governance and Justice | Asia (India) | Policy and Practice | Gender and Scale |
| Eco-health Interventions for Chagas Disease Prevention in Central America | Food, Environment, and Health | LAC (Guatemala, Honduras, El Salvador) | Multiple (Programme, Policy, Practice, Methodology) | Multiplicity of Pathways to Scale Used<br><br>Traditional Scaling Model (Pilot and Scale) |
| Addressing vitamin-A deficiency | Canadian International Food Security Research Fund | sub-Saharan Africa (Tanzania) | Product and Policy | Commercialisation<br><br>Private and Public Sector Entry Points |
| Assessing the Impact of Current National Policies to Reduce Salt and Trans-fatty Acids in Argentina | Food, Environment and Health | LAC (Argentina, Peru, Paraguay, Costa Rica, Brazil) | Policy | Shifting Learning from one Research Context to Another (Tobacco Policy to Sodium Policy)<br><br>Replication across International Borders |
| Southern Voice | Think Tank Initiative | Global | Methodology and Practice | Methodology Development<br><br>International coordination global |

## Annex 2 - Practical illustrations

| *Navigation Approach* | *Case Example* |
|---|---|
| **Regulation**<br>An entrenched, often mandatory, process. In many cases, this *navigation approach* will include formal mechanisms for enforcement. Examples include a law implicating a certain course of action or a policy with enforcement mechanisms strong enough to ensure implementation and pursuance. Research and innovation for policy influence will often follow this trajectory where research findings are reproducible, commonly endorsed, and little debate exists about the required immediacy of action. | The Salt Project seeks to reduce non-communicable disease incidence through industry regulation. Although in this particular case, voluntary adherence is not disqualified, mandatory regulations establish an acceptable level of salt in foods produced by manufacturers. Given the prevalence of these prepared foods in the countries where the project operates, fixed regulations have the potential to reduce salt intake considerably, and therefore the health outcomes of many (refer to Chapter 9 of the published book: McLean & Gargani 2019). |
| **Administration**<br>Here, scale occurs with soft regulatory or process adherence, likely driven by relevant actors (individuals or institutions) within the setting. Often administrators hold formal or informal power positions, which allow for certainty of implementation and *administration*. Examples include practice guidelines for physicians or defined approaches for teachers implementing an education curriculum. Innovation will follow this trajectory, where clear practice- or policy-oriented research questions have been addressed and findings are conclusive and applicable to the context of implementation. | The work of the RAHAT Project Team in India seeks to embed justice for survivors of sexual violence in State-wide practice. Part of this process involved establishing a Memorandum of Understanding (MoU) between the Department of Women and Child Development and the Majlis Legal Centre to work toward shared goals. The MoU provided access and credibility for the team among stakeholders in the justice system, and allowed the team to work towards implementing change and advocating for victims of sexual violence (refer to Chapter 8: McLean & Gargani 2019). |
| **Facilitation**<br>With *facilitation*, promoters or champions of the innovation play a catalytic role in scaling impact. *Facilitation* will have more to do with inspiration than enforcement and should allow for differences from one site or intervention to another to emerge and be accepted. An example of *facilitation* is the spread of a newly developed methodology for collecting data from a hard-to-reach population. The method may have proven | The Southern Voice project relies on facilitation on the part of individual members of a consortium to promote policy perspectives developed or identified by members of the network. In effect, it is an undirected system of champions. Working on issues that matter to them and their communities. In the model, think tank members will identify, research, and work with stakeholders on an issue and will then take |

| | |
|---|---|
| effective in a first application, and, to scale its potential impact, it has been spread coupled with *facilitation* and championship of its core components, for use in a new setting. | their findings to national or local actors—such as NGOs, the media, and advocacy groups—to promote and act to address the issue (refer to Chapter 10: McLean & Gargani 2019). |
| **Networking**<br>*Networking* implies planned dissemination of the innovation to targeted groups, which allows for the uptake and application to be chosen and defined by local people or network 'nodes'. Examples of this trajectory are the sharing of product plans at an investor summit, spread of programme improvement strategies via a professional organisation or programme manager's network, or workshops demonstrating a new practice or skill. When research results are preliminary and show promise of impactful benefit, this trajectory can allow the decisions of new users to lead the process of implementation. *Networking* can lead to selected uptake where an innovation holds potential and is particularly needed. | The Southern Voice project focuses, in part, on bringing national-level policy insight from its members to the international stage (as in the Facilitation example above). This contributes to international policy agenda setting and also helps share national policy insight among network members. These members can then use the national findings to influence their own policy work in new contexts (refer to Chapter 10: McLean & Gargani 2019). |
| **Self-scaling**<br>*Self-scaling* implies that the innovation is left in the hands of users (i.e., beneficiaries, policymakers, practitioners, investors, academics, buyers, and so on). When it works well, this scaling pathway is largely synonymous with the concept of 'going viral'—and uptake of the innovation is beyond the realm of control of the innovator. The scaling of research-informed tools or techniques which people seek out and use on their own can fall within this category. Individuals electing to adopt healthy eating habits is an additional example. The case of a product being brought to market can be another. It is possible that any type of research or innovation can follow this trajectory to scaled impact. Being mindful of the quality of results and the social implications (at varying scales) becomes incredibly pertinent for the innovator, researcher, and/or those wishing to follow this approach. | The Sunflower Oil project seeks to increase vitamin A intake in Tanzania not through regimented policy or a programme, but by developing and marketing a product that Tanzanians buy and consume. The project focuses on laying the groundwork for the sustainable, local production of vitamin A-fortified sunflower oil rather than simply providing this product directly to consumers. Once production is economically sustainable and the product is adopted by consumers, it can become a self-sustaining means of addressing vitamin A deficiency (refer to Chapter 11: McLean & Gargani 2019). |

## Annex 3 –

# A *Scaling Science* Case Study[6]: Scaling Ecohealth for Chagas disease prevention in Central America

> "We wanted to make changes in people's lives. I don't think about science in terms of writing papers and going to seminars. We need to use science for applied change in the real world. When we started, we had an eye to having this work with not just the people of Guatemala but all throughout Central America where Chagas was prevalent. The idea was really to help people with our science." - *María Carlota Monroy Escobar, Universidad de San Carlos de Guatemala, Interview*

**SUMMARY**

Chagas is a vector-borne disease endemic to 21 Latin American countries and is caused by the *Trypanosoma cruzi* parasite. In Central America, it has been most commonly transmitted to humans via two insect vectors—*Rhodnius prolixus* and *Triatoma dimidiata*. The latter is now the principal vector in Central America. In 2003, IDRC funded a project examining the effectiveness of an Ecohealth intervention for managing the transmission of Chagas disease to humans via the *Triatoma dimidiata*.

In contrast to traditional programmes focusing exclusively on spraying pesticides, the Ecohealth intervention consists of a two-step system. First, the vector is redirected to blood meal sources outside of the infested homes. Homes are then renovated to make them less hospitable for the vector. Proving highly effective in several Guatemalan test sites, the intervention was scaled through a second IDRC project to a larger number of communities in Guatemala, Honduras, and El Salvador. The programme's long-term objective was to address the emergence of Chagas disease across Latin America.

The two IDRC projects exemplify the scaling of a programme or system of related, science-based activities from a small set of communities in one country to 40 communities in three countries. The first project supported the Ecohealth intervention in its early, small-scale implementation phase. The second applied the intervention to a broader international context. The projects also provide an opportunity for examining how a systems approach can function, particularly where it is heavily dependent on community participation in diverging social contexts.

[6] The case study report is originally published in chapter 7 of McLean & Gargani 2019. It is reproduced here with Creative Commons CC-BY license, by the same author.

## Chagas disease

Chagas is a vector-borne disease endemic in regions across 21 Latin American countries. It is caused by the *Trypanosoma cruzi (T. cruzi)* parasite and its effects are potentially life threatening (World Health Organization 2016). The disease is common among rural and poor communities in Latin America, affecting more than 10 million people, and killing an estimated 10,000 people annually (IDRC 2011: 1).

The disease typically presents in two phases. The first is an acute phase, where large numbers of the parasite are present in the bloodstream. Most individuals suffer from mild symptoms or no symptoms at all during this phase, which lasts for approximately two months upon infection. The second is a chronic phase, where lower numbers of the parasite congregate in the heart and the muscles of the digestive tract. During the chronic phase, patients may suffer heart disease and digestive disorders (megacolon and megaesophagus), which can lead to heart failure or death (World Health Organization 2016).

In Central America, the *T. cruzi* parasite was transmitted to humans via two main insect species. The first, *Rhodnius prolixus,* was not native to the regions in which Chagas disease was endemic and was successfully eradicated by a domestic pesticide programme. The second, *Triatoma dimidiata*, is a native species and can live in homes, peri-domiciliary environments, as well as forested regions (IDRC 2011).

Since the elimination of *Rhodnius prolixus*, long-term management of Chagas disease through domestic spraying campaigns typically fails. Such campaigns can limit infestations, but only temporarily. Since *Triatoma dimidiata* is native to endemic regions, re-infestation often occurs within a few months of a spraying campaign. Moreover, *Triatoma dimidiata* tends to survive in peri-domiciliary and forested regions, migrating back to homes once pesticide levels subside (IDRC 2011).

## The Ecohealth intervention

In 2003, IDRC approved funding for the study of an environmental approach to Chagas disease management in Guatemala. Inspired by the primary researcher's earlier work, the project posited that Chagas disease could be effectively controlled in rural communities through a series of preventative measures, including:

- → home renovations and repairs of traditional rural dwellings; and
- → changes to peri-domiciliary activities, such as animal husbandry.

Under this approach, heavily infested homes are initially sprayed with insecticide as a preventive and control measure. Led by families themselves, home renovations then helped to create a space that is inhospitable to *Triatoma dimidiata*, significantly limiting re-infestation. For example, dirt floors are eliminated and wall crevices plastered to remove spaces where *Triatoma dimidiata* can thrive. Around homes that are only mildly infested, chickens and other livestock that provide a blood meal source for *Triatoma dimidiata* are relocated and contained to limit human-vector contact.

The intervention's implementation relied on the participation and coordination of numerous key players. Research and field staff communicated the details of the intervention to participating communities and secured their buy-in. Representatives from the Guatemalan Ministry of Health helped research and field

staff connect with communities and secure their consent, while municipal officials ensured that construction materials were available to participating rural communities. Consenting community members were also directly involved in home renovation and changes to peri-domiciliary activities. In the Jutiapa Department (located in the southeastern part of Guatemala), the project showed that the transmission of Chagas disease could be significantly reduced through the Ecohealth approach (IDRC 2003: 1).

IDRC consequently funded a second study in 2011 to assess the degree to which the Ecohealth intervention could be scaled up to other communities in Latin America and the Caribbean (LAC). Entitled "Ecohealth Interventions for Chagas Disease Prevention in Central America", the second project applied the intervention to other areas of Guatemala, Honduras, and El Salvador. Overall, the project sought to demonstrate that the risk of Chagas disease transmission could be significantly reduced through Ecohealth intervention activities (IDRC 2011).

The two projects provide an example for scaling a system of related, science-based activities for greater impact (IDRC 2016a). Their combined timeline charts the Ecohealth intervention from its early, small-scale implementation to its application in an international context. The projects also provide an opportunity to examine how a systems approach can function in different settings, particularly where it is heavily dependent on community participation. The intervention also exhibits potential for scaling beyond the scope of the second project. In the long-term, it could be adopted to eliminate Chagas transmission across Latin America.

**JUSTIFICATION**

**Clear continued need**

The 2004 environmental project demonstrated the effectiveness of the Ecohealth approach in preventing the transmission of Chagas disease. It developed an approach that was superior to alternatives commonly used to combat Chagas transmission by *Triatoma dimidiata*, the primary vector in Central America. The endemic state of Chagas in regions beyond the scope of the first project also demonstrated a clear need to apply the intervention in other contexts. The effectiveness of the Ecohealth approach, combined with the endemic state of Chagas in other regions, provided a strong *Justification* for scaling the intervention.

## Insights from scaling

Following the success of the first project, IDRC discussed the potential for scaling with the principal investigator (PI). Scaling the intervention aligned with the PI's original motivation for undertaking this work. The Ecohealth approach was designed to apply to a broad range of rural communities in Central America. The materials used to renovate the homes, for example, were in part chosen for their wide availability. Rural communities also often lacked tools for construction. To ensure broad appeal, the renovations (e.g., plastering walls, replacing dirt floors) were designed to require only a few tools, if any.

Despite these early considerations, expanding the Ecohealth intervention to approximately 40 communities across Guatemala, El Salvador, and Honduras involved more than replicating the intervention used in the Department of Jutiapa. The interventions introduced in each village needed to be calibrated to meet the context of each village. Each community was differentiated by its own leadership, way of thinking, and reaction to the proposed intervention. To successfully implement the Ecohealth approach, the project team needed to actively engage municipal actors, health and vector control staff, as well as individual community members.

Securing consent also required a demonstration of how the intervention could benefit individual residents. In many cases, one model home was chosen to demonstrate how the renovations would take place and peri-domiciliary activity would be changed. However, as the range of communities involved grew, gaining this trust proved more difficult. Before making a final decision on their involvement in the project, some communities requested that the project team offer a small-scale demonstration of the renovation work. The geographic proximity of the implementing team to participating communities was also key. It provided an avenue for regular contact between the project team and community members to address questions or concerns.

Some key elements of implementation, such as the replacement of dirt floors and the plastering of walls, needed to remain constant. Other elements, however, could be adapted to local preferences. As the intervention work expanded, communities began to introduce unique local features. One community, for example, changed the colour of the plaster used to renovate the homes to mirror its traditional aesthetic. A different community incorporated plant material into its plaster to improve waterproofing.

The intervention's success also rested on clearly understanding and addressing gender roles (Rocío Rodríguez Triana et al. 2016). To successfully secure buy-in, meetings between the project team and community members needed to involve both men and women. Meetings were consequently scheduled on weekends to accommodate the availability of both genders. Some community members were more willing to discuss the intervention in a group of their own gender. Ensuring gender equity in the composition of project implementation teams was therefore key. Gender also played a significant role in the renovation work. Men most commonly participated in the intervention work by moving construction materials and undertaking manual labour. Women and children, on the other hand, were more likely to take on the plastering of walls. In fact, engineers initially failed to recognise this gender dimension and attempted to engage men in plastering homes. Admittedly, these gender dimensions were not transformative, but understanding and accommodating them was crucial to the success of the scaling effort.

In addition to community participation, the Ecohealth intervention rested on collaboration between the project team, municipalities, and government ministries. In each of the three countries, the nature of this collaboration varied. In El Salvador, for example, the project team exhibited a strong academic background, but limited field experience. It also lacked a strong relationship with the vector control programme. Moreover, the support of the national Chagas control programme did not translate into concrete field engagement. This lack of field experience and limited engagement from vector control staff made initial engagement with communities in El Salvador more difficult. Over time, however, the team was able to account for these gaps by developing a collaborative relationship with primary healthcare centres.

The participation of municipal actors was also critical. They were often responsible for treating Chagas patients. Moreover, while the materials used to renovate the homes were affordable, they often had to be transported from remote parts of the country. These added transportation costs would have rendered the intervention prohibitively expensive for most rural communities; however, municipalities often assumed this responsibility and the related expense.

**COORDINATION**

**Buy-in as the foundation for Coordination**

The success of the Ecohealth intervention rested on a participatory multi-stakeholder approach, as well as community buy-in. Scaling came with a more diverse set of communities, marked by variation in the initial level of interest and readiness to participate. This diversity was managed through a close working relationship between community members and the team delivering the intervention.

**Community buy-in through local custom**

While the scaling of the Ecohealth approach included some constant elements, it was also responsive to local customs. By allowing communities to make the intervention their own, this flexibility also secured buy-in, while facilitating collaboration between community members and the intervention team. Flexibility was thus key to both scaling the Ecohealth approach and enhancing delivery.

*(continued)*

**Accommodating gender roles**

Community participation required a recognition of gender roles. While not gender-transformative in its intentions, the Ecohealth approach recognised that men and women needed to be engaged through different activities. Scaling to a wider range of communities introduced greater variability in gender roles, reinforcing the importance of gender responsiveness for effective delivery.

**Establishing roles for success**

The Chagas case also demonstrates that, in the context of scaling, *Coordination* involves more than the participation of stakeholders. It can require a division of roles based on preferences and comparative advantage. The allocation of clear responsibilities and roles to each participating actor made for more effective *Coordination*.

Community dynamics, combined with the strength of partnerships between participating organisations, contributed to variation in implementation rates. As the project's PI notes, some communities struggled to renovate 40 percent of their homes, while others were able to renovate up to 90 percent. In some cases, construction was completed within six months, while in others renovations went on for years. Moreover, in most communities, an 80 percent renovation rate was required to ensure resistance to vector infestation and Chagas transmission.

During the early stages of the Ecohealth project, data was recorded on key participant characteristics, including socio-demographic markers, intervention participation, and communication with other stakeholders. The goal was to draw on this empirical evidence to identify determinants of the intervention's success, particularly at subsequent stages of scaling. Such monitoring and analysis would have provided key insights for adjusting scaling to amplify impact over time. A lack of resources, however, prevented the project team from fully analysing and leveraging the data to inform subsequent scaling efforts.

Despite these early monitoring attempts, most of the determinants of success were established only at later stages. The project team initially focused on communities only. As the intervention was scaled to approximately 40 communities and participant diversity increased, the body of evidence for identifying unique community, municipal, and national determinants of intervention success grew. New patterns of behaviour and determinants of success emerged, which allowed tailoring the intervention to the characteristics and needs of each community.

**DYNAMIC EVALUATION**

**Anticipating factors for success**

The Ecohealth project demonstrates both opportunities for and challenges to anticipating success factors when scaling. Earlier work helped identify patterns of behaviour among strategic partners that were more likely to ensure the intervention's success. As the intervention was applied across a larger sample of communities, however, additional factors of success emerged. In the context of scaling, this suggests a key role for *Dynamic Evaluation* to ensure that programming remains effective.

The scaling process was also characterised by a multiplier effect. As the intervention was scaled and its benefits were more broadly recognised, households and organisations that were not associated with the project began to independently take up its core activities. Motivated to increase their standard of living through an improved living space, for example, some non-participating families adopted the home renovations element of the Ecohealth approach. Similarly, as home renovations showed effectiveness in limiting the transmission of other diseases, NGOs working in Latin America began to employ the Ecohealth approach to pursue their own disease prevention mandate.

Nonetheless, variation in the application and success of the Ecohealth intervention, combined with its multiplier effects, made determining *Optimal Scale* more difficult. A household renovation rate of 80 percent within communities represents a concrete target. However, the spontaneous uptake of the intervention by individual households and other organisations made it more difficult to determine the degree to which any one programme or organisation should apply the intervention.

Leveraging the self-reinforcing nature of the scaling process and building partnerships proved to be a key feature of the intervention's success. Chagas disease transmission continues in Central American countries, signaling a further need for the intervention. However, it is unlikely that the Ecohealth approach alone will be able to fully address this need. Partnerships and the self-reinforcing nature of the intervention offer an opportunity to scale the Ecohealth approach beyond the project's conclusion.

Rather than focusing on establishing a single optimal level of scaling, stakeholders involved in the intervention often pointed to the need to apply the intervention in endemic hotspots as these were identified. Key regions throughout Central America continue to suffer from high levels of *Triatoma dimidiata* infestation and, by extension, Chagas disease transmission. In fact, the Ecohealth project was supported by the Intergovernmental Commission for Chagas Control in Central America, which has identified a number of priority hotspots. Determining the *Optimal Scale* for the implementation of the Ecohealth intervention is therefore a dynamic process.

To build on these results, IDRC and researchers in Central America have partnered with other agencies to support an integrated approach to Chagas control. International agencies and local governments will need to assess a variety of issues, including the *Coordination* of multiple actors, the *Optimal Scale* of intervention, and the development of a *Dynamic Evaluation* stance. This effort presents an opportunity to scale the Ecohealth intervention and broaden its reach.

**OPTIMAL SCALE**

**The interplay between intent and scale**

The Ecohealth projects demonstrate how *Optimal Scale* is multidimensional. While the intervention was designed to address Chagas disease transmission, it effectively addressed other development and disease prevention needs. Home renovations, for example, contributed to an improved standard of living for families. This positive multiplier effect presents arguments for further scaling. Optimality is thus a function of both the intended effects of an intervention and its scaling effects.

**Optimality at the project versus intervention level**

Concerns surrounding the sustainability of the Ecohealth intervention demonstrate an interplay between defining *Optimal Scale* at the project level and the intervention level. Projects that apply an intervention often do so to achieve maximum impact given resources and budget, recognising that the project alone may not fully address the need. Where multiple groups are involved, *Optimal Scale* for one group may be a function of the work performed by another. However, to fully address the transmission of Chagas, an optimisation function that ties intervention scale to continued and demonstrated need is necessary.

The scaling of the Ecohealth approach in Guatemala, El Salvador, and Honduras presents a number of key lessons that relate to:

- → the importance of addressing regional and community needs in making individually small, but collectively important, changes to an intervention when scaling;
- → the need to consider the logistics of implementing the intervention, including timing, and to remain flexible in cooperating with regional partners;

- → the need for a strong evaluation design during scaling, including one that considers sustainability in the face of potential scaling effects;
- → the need for a policy influence strategy, and knowledge exchange process, such that elements of the intervention can be adopted by others and scaling can continue beyond the life of the project; and
- → the need to demonstrate the additional, and sometimes unanticipated, benefits of the intervention to encourage broader adoption and continued scaling.

For more information about the Ecohealth intervention, please visit **www.idrc.ca/en/project/ecohealth-interventions-chagas-disease-prevention-central-america-0**.

**PROJECT DETAILS**

**Title:** Ecohealth interventions for Chagas disease prevention in Central America

**One or more projects:** 2—#101812 and #106531

**Scalers:** Asociacion de Investigacion y Estudios Sociales/Association for Research and Social Studies

**Research institution:** Universidad San Carlos de Guatemala (USAC)

**IDRC Programme:** Food, Environment, and Health

**Geographic region:** Latin America and the Caribbean

**Scale statistics:** Intervention approach has been implemented in approximately 40 communities and is being actively adopted by organisations not directly involved in the project.

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**Chapter 6 –**

# *The Scaling Playbook: A Practical Guide for Researchers*

**Summary**

This chapter showcases a novel tool – *the Scaling Playbook* – intended for distribution by research funders to their grantees, and practical application by researchers who aim to scale their impact. The publication is based on the results of the *Scaling Science* research stream (summarized in chapter 5 of this dissertation and published in the book by McLean & Gargani 2019). Specifically, the *Playbook* presents an overview of key scaling concepts, articulates how scaling can supplement a research process, provides practical worksheets to build this evidence into research projects, and offers 2 illustrative case studies. It is included in this dissertation to demonstrate the quality and diversity of research translation efforts that have been an integral part of my research approach.

**Role of the PhD candidate:** As senior author of the *Scaling Playbook*, I conceptualized the guidance document and the corresponding design of the tool, I drafted the first version, provided content and editorial inputs on subsequent drafts. I pilot-tested the *Playbook* in two separate gatherings of maternal health research teams; once in Dar Es Salaam, Tanzania in May 2019; and again in Kigali, Rwanda in January 2020. Following trialing and inclusion of stakeholder feedback, I oversaw the graphic design and instructional layout to ensure a captivating final product. Finally, to enhance accessibility, I supervised professional translation into French and Spanish.

**Reference:** International Development Research Centre. The Scaling Playbook: A Practical Guide for Researchers. https://www.idrc.ca/en/news/new-guidance-researchers-aiming-scale-results. Published 2020.

# The Scaling Playbook

## A Practical Guide for Researchers

scaling science

IDRC | CRDI
International Development Research Centre
Centre de recherches pour le développement international

# Introduction

SCALING IMPACT is a priority for the International Development Research Centre (IDRC) and the broader development community. But how to best achieve impact at meaningful scales is far from straightforward. Pathways to impact are winding, systems are complex, and scaling involves a multiplicity of actors.

To better understand the process of scaling in the context of research for development, IDRC explored the work of numerous researchers who purposefully aimed to produce impact at scale with their work. This exploration yielded unique information about what creates desirable change and meaningful impact. It resulted in the IDRC open-access book, ***Scaling Impact: Innovation for the Public Good***, and now, ***The Scaling Playbook***.

By building on lessons from the past, the playbook presents an evidence-based and action-oriented tool that provides a practical way to approach the complex challenge of scaling for impact. It is intended to help you proactively incorporate scaling into research—whether you are new to scaling, wish to strengthen existing efforts to scale your work in development, or perhaps beyond.

This playbook is a starting place. Nothing in it is conclusive or complete. We invite all users to tailor, adapt, and critique the ideas offered through the coming pages.

# PART I
## Background

### What is scaling science?

THE TERM 'scaling science' purposefully embraces two meanings:

- First, it means *scaling scientific research* results to optimize impacts. That is, scaling the impacts of research for the public good.
- Second, it refers to a systematic, principle-based *science of scaling* that can increase the likelihood that innovations will benefit society. All approaches to scaling should be questioned, tested, refined and used thoughtfully.

Innovators working with IDRC find that scaling in research for development aims to achieve a scale of impact important to people and environment, and contribute to a broader system of development change. In other words, scaling means understanding how to position research results so that the solutions generated reach the people who can use them, and in a way they can endorse.

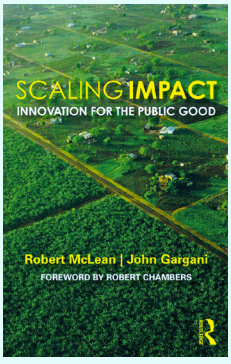
At the same time, our work to synthesize this experience and apply it to advance scaling practice is one contribution to a science of scaling. Your efforts to test, refine, and improve these ideas are just as important.

The IDRC scaling science exploration yielded unique information about what creates desirable change and meaningful impact. From this perspective:

> «Scaling impact is a coordinated effort to achieve a collection of impacts at optimal scale that is only undertaken if it is both morally justified and warranted by the dynamic evaluation of evidence.»

**FURTHER READING**

**Explore a deeper dive into scaling science in the open access book:**




**Scaling Impact: Innovation for the Public Good**

**Authors:** Robert McLean and John Gargani

**ISBN** 9781138605558

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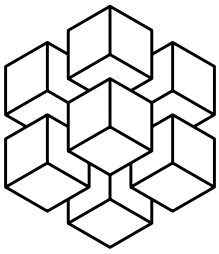
**Available formats** PDF | Epub | HTML5 | Print

## Four guiding principles for scaling impact



### 1. Justification

- → Scaling is a choice that must be justified.
- → The choice is made by the balance of evidence alongside values.
- → The choice to scale is shared.

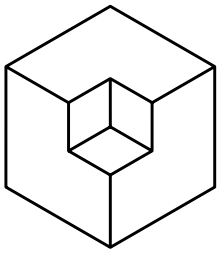
To make the principle of justification practical, it begins with the question "why scale?" The answer should include:

- Technical evidence that scaling will produce positive impacts that outweigh negative impacts; and
- A description of the values (including whose) that inform the decision to scale.

These responses can help you articulate a value proposition as a basis for decision-making about scaling. Sometimes, however, it is better not to scale.

**Scientific evidence can help you understand whether an innovation *can* scale. But the values of those impacted will inform whether an innovation *should* scale.**

Articulating both evidence and values can help you enlist various stakeholders in the scaling process since they can see the justification for the scaling efforts. Doing so encourages participation and stakeholder endorsement.



### 2. Optimal Scale

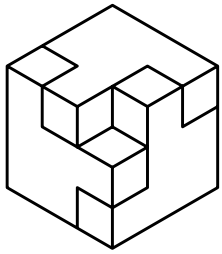
- → More is not necessarily better.
- → Scaling produces a collection of impacts.
- → Impact at optimal scale balances dimensions of magnitude, variety, equity, and sustainability.

Optimality challenges the "bigger is better" logic of scaling.

**Simply because a solution works at a local level doesn't mean that implementing it nation-wide or beyond will multiply the benefit. Likewise, if a solution proves ineffective at a local level, we cannot automatically conclude it won't produce desirable impacts at broader scales.**

Determining optimal scale requires ongoing considerations of the trade-offs between magnitude, sustainability, equity, and variety of impacts. For example, improving efficiency for hospital visits may not always correlate with better patient outcomes; just like technological innovation in agriculture may or may not mean concomitant benefits for the environment.

Optimality also raises the question of who defines this 'right' scale. Numerous stakeholders, including researchers, funders, and beneficiaries, may all have different views. Considering different perspectives, and setting out a process to determine optimal scale that stakeholders endorse is key to successfully scaling impact.



### 3. Coordination

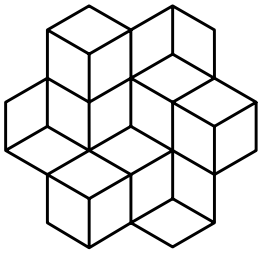
- → Scaling occurs in complex systems.
- → Complexity requires a flexible scaling process.
- → Coordination connects an evolving set of actors to the scaling process.

Coordination refers to the need to plan and adapt for the many actors involved in bringing impact to scale. This principle reminds researchers that scaling takes place in complex systems and that complexity demands a flexible scaling process.

Accordingly, coordinating a scaling journey requires a strong understanding of the system in which one operates, while acknowledging that unintended impacts are possible and therefore require ongoing monitoring. This includes, for example, the understanding and accommodation of gender dimensions when coordinating with various actors in your scaling effort.

**Coordination implies that researchers consider the wider range of initiators, enablers, competitors, and impacted. These groups may affect, or be affected, by scaling in ways that alter intended impacts.**

Such broad engagement may occur within a single project, or as a part of a longitudinal series of coordinated research projects and activities are coordinated to work together. At the same time, organizations may use a 'portfolio approach' to coordination, whereby they syndicate projects or innovations for greater impact from the portfolio, than would be produced by the individual parts.



### 4. Dynamic Evaluation

- → Scaling is an intervention that can be evaluated.
- → Scaling generates dynamic change.
- → Dynamic evaluation is a stance that is held before, during, and after scaling.

Because scaling generates dynamic change, it necessitates dynamic evaluation. It can use a collection of tailored learning strategies to examine how scaling transforms a holistic concept of impacts – assessing the magnitude, variety, equity, and sustainability of change.

**Dynamic evaluation goes beyond asking whether impact was achieved at a certain date, and instead asks how, why, under what conditions the impact was achieved, and how this might change over time and place.**

Dynamic evaluation is not a method, it is a stance. It aims to measure the collection of impacts of scaling as an intervention. Not just the impact of the innovation or research at a single level of scale. This implies a body of tools for rounding rapid learning cycles that can be used strategically before, during and after scaling and the choice of tools relies on the judgement of those involved in the scaling system.

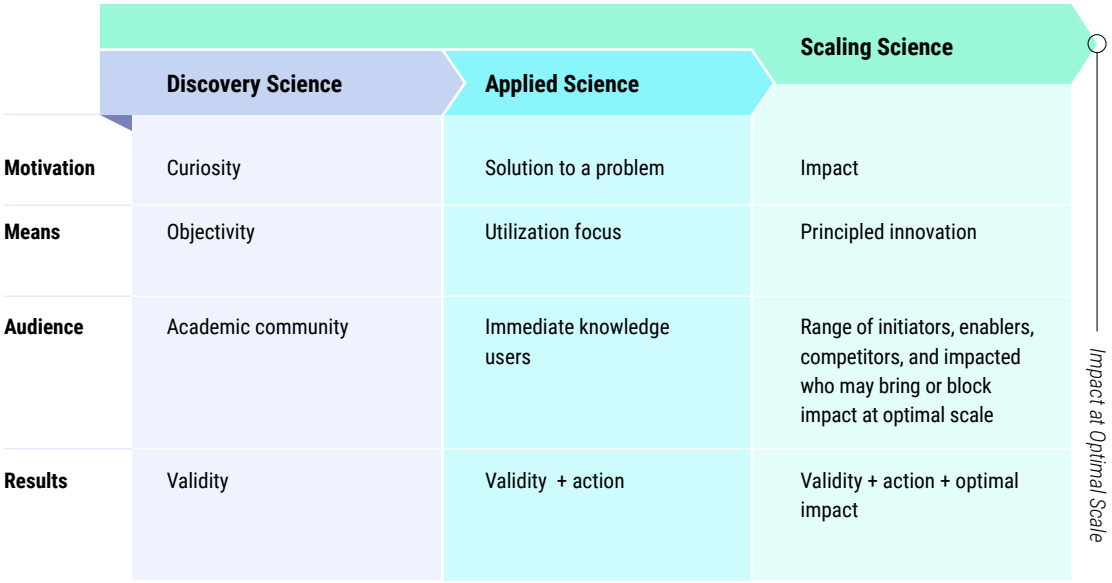
### Scaling science as a component of research for development

Research for development is intended to achieve impacts that promote development through discovery science or applied science. To illustrate how scaling can complement either of these approaches to research, we introduce a third notion we call scaling science.

Illustration 1 provides a simplified overview of these three approaches to research, where they feed into and how they build on one another:

ILLUSTRATION 1

**Discovery, applied, and scaling sciences are complementary**




Despite the simplified model above, moving from discovery to scaling is not a linear, additive process. The distinction between these approaches is rarely clear, and the categories are not always mutually exclusive.

Scaling impact requires mechanisms and varied knowledge sources that can move research back and forth along this spectrum. It is important to note that researchers need not continue scaling if there is not enough evidence to support an innovation, or if those who will be affected do not endorse it.

### Knowledge translation and scaling

Scaling and knowledge translation activities share many features. Both require justification, coordination, and evaluation to monitor how well an innovation works as it is put into action.

Scaling, however, is a supplement to knowledge translation. It moves beyond targeting knowledge users in a specific context and instead considers the full range of initiators, enablers, competitors, and impacted who will support or hinder downstream results of the innovation. In essence, scaling moves researchers' mindsets beyond outputs or solutions (often described as outcomes) and towards *impact*.

**Knowledge translation is about moving research-generated knowledge into action.**

**Scaling is how we amplify, distribute, sustain, and at times de-scale, the impact of these actions.**

ILLUSTRATION 2

**How the results of discovery, applied, and scaling science are positioned for use**


# PART II
## Application

THIS SECTION acts as a guide to help integrate scaling into your research. It is followed by a worksheet with prompting questions to make the conceptual guidance actionable.

Throughout this section, we alternate between two case studies to illustrate the concepts. The complete case studies can be found in the Annex.

**CASE STUDY 1**

A research project in Nigeria used scaling science to address the high rate of mortality associated with pregnancy and childbirth when pregnant women could not reach health facilities for prenatal care.

**CASE STUDY 2**

A research project in Tanzania used scaling science to address vitamin A deficiency that was leading to blindness, diarrhea, and measles.

### Integrating scaling into research

Successfully scaling impact can require continuous reflection on the four guiding principles (justification, optimal scale, coordination, and dynamic evaluation) from start to finish of a research project.

To help build scaling into your research, this playbook focuses on how these principles can support research at three typical stages:

- Framing— selecting the research topic, focus, and questions.
- Doing— data collection, analysis/synthesis, and interpretation.
- Sharing— communicating research results.

These are generalized, and in many ways over-simplified, representations of stages in a research process. However, they broadly represent the steps of the scientific method, used across every field of science, to plan and subsequently execute a research protocol. As such, we hope researchers will find these relatable, while noting that some degree of context-fitting is required.

Each stage is described below and includes prompting questions to consider when integrating scaling concepts into your research. It also compares how each consideration might have been interpreted in discovery or applied science.

### A— FRAMING: Focus and questions

The first step in any research is to set a focus and parameters, and when it comes to scaling science, to fulfill the first principle of justification by asking "why scale?"

**Research questions define the goals of the research, and reflect its motivations and purpose. Why is this research important? To whom is it important? What will an answer to this question contribute? How might it help solve a problem? Why and how might that solution be scaled?**

Sometimes this process plays out across a community looking for answers to a social problem; at other times it is led by a specialist in a lab.

Although different types of research approach framing in different ways, each employs similar ways to identify a problem, investigate it by asking questions and construct an appropriate methodology for answering these questions.

How we frame our research will affect how its impact is scaled. Framing contrasts across different sciences—discovery, applied, and scaling science—as summarized in Illustration 3:

ILLUSTRATION 3

**"Framing Research" in discovery, applied, and scaling science**

| | Discovery Science | Applied Science | Scaling Science |
|---|---|---|---|
| **Motivation** | Curiosity | Solution to a problem | Impact |
| **Goal** | To generate new knowledge | To generate knowledge of practical value to a specific problem | To generate knowledge about the optimal benefit of a solution |
| **Justification** | The research addresses a knowledge gap | The research offers a solution to a local problem. Often engages research users' perspectives | The research is broadly endorsed within the scaling system in which impacts unfold. Includes the initiators, enablers, competitors, and impacted |

The justification for scaling tends to be wider than that for the other types of research. It refers to the broader areas in which research outcomes and impacts will unfold. This pushes researchers to justify the work not only as initiators, but also among other actors—including enablers for scale, competitors who may hold alternative solutions, and most importantly, the endorsement of those who will be impacted, for better or worse, by the research.

**Questions to consider when framing research:**

*i— Based on the research focus and question(s), what potential opportunities might grow the impact of your research?*

Framing a research project for scale means to plan for diverse impacts that might unfold from the work, and develop strategies to help desirable impacts come to fruition. Where else could the results of this project make a difference? Who and what could benefit? Who and what could be harmed?

**CASE STUDY 1**

**To address the high mortality rate associated** with pregnancy and childbirth in Nigeria, the research team was attentive to opportunities to scale universal home visits for pregnant women **within** the state. If results were positive, there could be opportunities to scale **beyond** the state level—although not within the original project scope.

**MAPPING THE SCALING SYSTEM**

Considering the 'people, places, and things' that affect or are affected by scaling helps to plan for broad and positive impact. For simplicity we suggest thinking about 4 categories in a scaling system:

**Initiators** are people, places, and things, that make it possible to begin a change in scale, and may include:
- Innovators/researchers
- Funders/investors
- Permissions
- Know-how
- A willing community
- Land with a specific set of attributes
- Cultural acceptance

**Enablers** are the combined people, places, and things that can facilitate the scaling, including:
- Service providers
- Laws
- Policymakers
- Distributors
- Culture
- Markets
- Communities
- Government

**Competitors** are the people, places, and things that, in combination, offer a next-best or better-than alternative to scaling the innovation, such as:
- Commercially competing companies or products
- Substitute ideas
- Social or cultural norms
- Ingrained habits and traditions

**The impacted** are those who experience the positive or negative results from scaling, and ultimately control success:
- People
- Places (natural or built environment)
- Things (such as cultural and gender norms, laws, and ideas)

Thinking about potential impacts can be broad and aspirational—you can always scale back ambitions at a later stage.

***ii— Who/what are the people, places, and things (initiators, enablers, competitors, those impacted) that affect and are affected by the scaling process?***

This question considers the broader range of people, places, and things (such as cultural and gender norms, laws, institutions, etc.) with the potential to enable or constrain scaling of results beyond the immediate users. Grouped under broad categories of various actors as seen on page 6, these can include:

- Governments or policy makers with priorities or ongoing policy processes related to the expected research results;
- Regulatory frameworks that could enable or hinder uptake of an innovation;
- Cultural and gender norms and practices that facilitate or inhibit ideas from spreading in desirable or undesirable ways; or
- Alternative approaches or innovations that address the same or a similar research problem.

**CASE STUDY 2**

In Tanzania, researchers considered manufacturers of sunflower oil based locally, a delivery network of retailers, outreach activities to make refined sunflower oil the preferred choice for consumers, and the Government of Tanzania's broader micronutrient fortification strategy.

***iii— Which users and beneficiaries should you consult to understand and justify the research framing and its potential impact?***

When impact at scale is priority for a research project, it is critical to gather and assess evidence of the technical merit of an innovation. Evidence that an intervention—say, a new program or practice—can produce the desired result is critical to inform rollout and scale.

However, evidence of technical merit can only tell us if an innovation *can* scale, not whether it *should* scale. To determine whether it should scale, consider the significance and value to those who will be impacted; a key component of the justification principle.

It is helpful to consult with different user groups and potential beneficiaries before defining the research question(s). This will allow you to better understand their contexts. Then you can confirm or reject the importance of the research problem, and develop a framing that aligns with the characteristics, needs, and values of those who will ultimately determine and realize impact.

Declaring and openly unpacking potential impacts, positive or negative, from the start of a project will help ensure framing is ethical and the results of the research are optimally impactful.

**CASE STUDY 1**

In Nigeria, the research team collaborated closely from the beginning with planners, policy-makers and government officers to ensure the research question addressed essential concerns and the content of the home visits were endorsed. They also surveyed households to determine factors related to maternal morbidity to ensure the home visits focused on the right issues.

## B— DOING: Data collection, analysis/ synthesis, and interpretation

After framing a research problem and approach, typically the next step is to determine how to undertake the research. This includes identifying what data will be needed and selecting the best methods to collect, analyze/synthesize, and interpret the data.

In the "doing" phase, the various sciences—discovery, applied, and scaling—all have different goals, just as in the framing stage. The processes build on one another and diverge to provide different results, as summarized in Illustration 4 on the next page.

Rarely is a single solution the best fit for an entire population, and rarely do innovators or their funders have the resources required to scale to entire populations alone.

The scaling principle of dynamic evaluation means that data collection, analysis/synthesis, and interpretation in scaling science should help determine *optimal* scale, rather than unquestioningly pursuing *maximum* scale.

**Questions to consider when doing research:**

***i— What evidence is needed to determine optimal scale?***

Answering this question will help researchers design data collection, analysis/synthesis, and interpretation, and will help determine the scale at which results will be most beneficial.

What data would help you understand a holistic concept of impact? Begin by assessing the following impacts the research can achieve:

- **Magnitude:** How much impact will the intervention create? This may include the average size or quality of impacts; how many people benefit or are harmed; and the importance, value, or merit of such impacts as judged by stakeholders.
- **Variety:** What is the range of impacts the research will create? Are there different types of impacts (such as health, economic, environmental) that the research will create?
- **Sustainability:** How long will impacts last, and what factors might affect this?
- **Equity:** What benefits and/or harm will different sub-groups experience as a result of the research? Do specific sub-groups (based on gender, religion, or class for example) experience impact differently, and what factors affect this?

**CASE STUDY 2**

In Tanzania, optimal scale included technical evidence that local enterprises could indeed produce enough fortified oil to satisfy regional demand, that it was cost-effective, and that it could be successfully disseminated to regional populations.

Evidence was needed to show to what extent fortifying the oils benefited the lowest-income households. Could they afford to purchase the fortified oil? Did the incentives work to encourage the population to use it? Was there enough evidence on the impact of the oil to increase vitamin A levels and show the intended health benefits?

ILLUSTRATION 4

**"Doing Research" in discovery, applied, and scaling science**

| | Discovery Science | Applied Science | Scaling Science |
|---|---|---|---|
| **Goal** | Validity and reproducibility | Validity and utility for primary knowledge user | Validity and optimal impact for beneficiaries |
| **Means** | Objective approach:<br>Data collection, analysis/ synthesis, and interpretation aim for objectivity and validity, with a clear protocol that other researchers can replicate | Targeted utilization-focused approach:<br>Data collection, analysis/ synthesis, and interpretation aim for validity and of most use to the targeted user | Inclusive utilization-focused approach:<br>Data collection, analysis, and interpretation aim for optimal impact. Possible impacts of the work are named and considered, and decisions about which to pursue are balanced by need and feasibility |
| **Results** | Sound analysis/synthesis:<br>Examines, assesses, and compares the data in a systematic and reproducible way | Sound + relevant and actionable analysis/ synthesis:<br>Pinpoints and prioritizes practical issues in the data, and offers techniques that facilitate clear understanding and uptake by the primary knowledge user | Sound + relevant and actionable + optimally impactful analysis/synthesis:<br>Investigates practical issues in the data, and offers techniques that facilitate uptake by a range of users who can apply the results at scale for optimal impact |

*ii— How will you involve stakeholders appropriately in data collection, analysis/synthesis, and interpretation?*

To ensure research meets the needs of the stakeholders and contributes to intended impacts, it is important to ensure that those that affect and are affected by scaling actively help define the research approach in ways that are feasible and endorsed by stakeholders.

Involving stakeholders in doing research implies they participate in answering critical questions such as:

- What data is collected?
- How is the data unpacked and assessed?
- Who interprets, and what is, its validity, meaning, and importance?

This requires coordinating the contributions of different actors to help encourage ownership of the research and its results, while taking into consideration contextual factors such as cultural and gender norms. Determining when and how different stakeholders may be involved in *doing* research can help ensure rigour, an understanding of its complexity, and improved aims for optimal impact.

**CASE STUDY 1**

In Nigeria, the project involved and trained Bauchi state government officers and officers from the local government authorities to manage and monitor the universal home visits. Trained officers took over implementation in two wards, and played an active role in supporting the research team in data analysis and writing up results.

*iii— What key moments can you foresee for learning and adaptation?*

Once you have identified what evidence will inform an understanding of optimal scale, next determine how to use this to inform moving toward this desirable collection of impacts.

Plan to reassess your scaling efforts and approach at opportune moments within the research process. Consider any external opportunities to involve stakeholders in this process and promote uptake. What are the key windows of opportunity in the decision-making processes?

**CASE STUDY 2**

In Tanzania, the team realized early on through their interactions with retailers that low-income households frequently tend to buy very small amounts of cooking oil—just enough for one day. To adapt, the project team offered consumers smaller packaging options.

As well, the E-voucher system encountered a number of difficulties, leading the research team to adjust its approach during the project's implementation. They adapted by switching to a retailer-oriented discount called eWallets.

## C— SHARING: Communicating research results

Both applied and scaling science aim to responsibly engage knowledge users throughout the research as seen in Illustration 5 on the next page. This engagement helps ensure that the results of the research will be relevant and actionable.

Existing structures can be used to share the research beyond normal research channels and engage a wider group of stakeholders. This might, for instance, involve government planning bodies to broaden the reach of a policy, or markets that allow wide distribution of a new technology.

Dynamic evaluation can help to identify potential users who could benefit from research results on an ongoing basis, as well as those that might help sustain the impacts. Such broad engagement also helps to ensure that key stakeholders inform and endorse the definition of optimal scale.

**Questions to consider when sharing research results:**

*i— What strategies will facilitate participation, and contribute to the intended impacts of your research?*

Involving users and beneficiaries in framing and in doing research may already contribute to the likelihood that they will *endorse* results.

But further action is likely required. Consider which strategies will facilitate stakeholders to take action based upon the research findings. For example, what contextual factors might affect the ability to act on the results, and what can you do to address these factors?

ILLUSTRATION 5

**"Sharing Research" in discovery, applied, and scaling science**

| | Discovery Science | Applied Science | Scaling Science |
|---|---|---|---|
| **Goal** | To contribute to the body of knowledge on the topic | To enable targeted knowledge users to learn about and act upon research results | To engage those with the potential to act on and benefit from the research results in the setting of the study and beyond |
| **Audience** | Academic community | Immediate knowledge users | Range of initiators, enablers, competitors, and impacted who may bring or block impact at optimal scale |
| **Timing** | Share results at the findings stage, once data collection and analysis are complete | Share results at the findings stage AND involve primary research users in the research process so that they can shape it according to their needs | Share results at the findings stage AND integrate a range of potential users and beneficiaries into the research process so that they can help determine and achieve optimal scale |

**CASE STUDY 1**

In Nigeria, the research team highlighted the need to continue to monitor the implementation of home visits as they were being rolled out in different communities and contexts.

Training government officers in data-monitoring and quality-control methods, as well as in data management, analysis, and reporting, is critical to ensure the sustainability and effectiveness of home visits.

to act as intermediaries, for example, to encourage ongoing uptake of results or to support uptake by key stakeholders.

In some cases, implementing strategies to extend impact may be possible within the scope of an existing research project, especially if the researchers consider scaling early on and budget accordingly. In other cases, it may require additional resources or a new research project altogether.

### *ii— Are there particular findings or aspects of your analysis that may be of use to stakeholders beyond those you targeted throughout the research?*

Scaling does not end with ensuring uptake by a predetermined set of users and beneficiaries. It is a dynamic and iterative process reliant on an evolving set of actors and new actors may significantly shift the original vision of optimal scale.

Consider what results could be useful or influential to a broader range of stakeholders—including any unintended results. This may involve extending impact through replication in another context or reinforcing impacts through involving additional stakeholders in the same locale. Some users may also be well positioned

**CASE STUDY 2**

In Tanzania, the project shows how and under what conditions market mechanisms can be used to support food fortification efforts. Scaling the development impact is not only confined to **scaling to more regions** than the original project, but also to **scaling more products** that need enhanced nutrition.

The team found that government policies and regulations must go hand-in-hand with efforts to enhance nutrition. The regulatory system for any such fortification efforts should be clear and align well with the operation of the enterprises involved in the fortification process. Coordination is therefore of utmost importance in such scaling efforts.

ILLUSTRATION 6

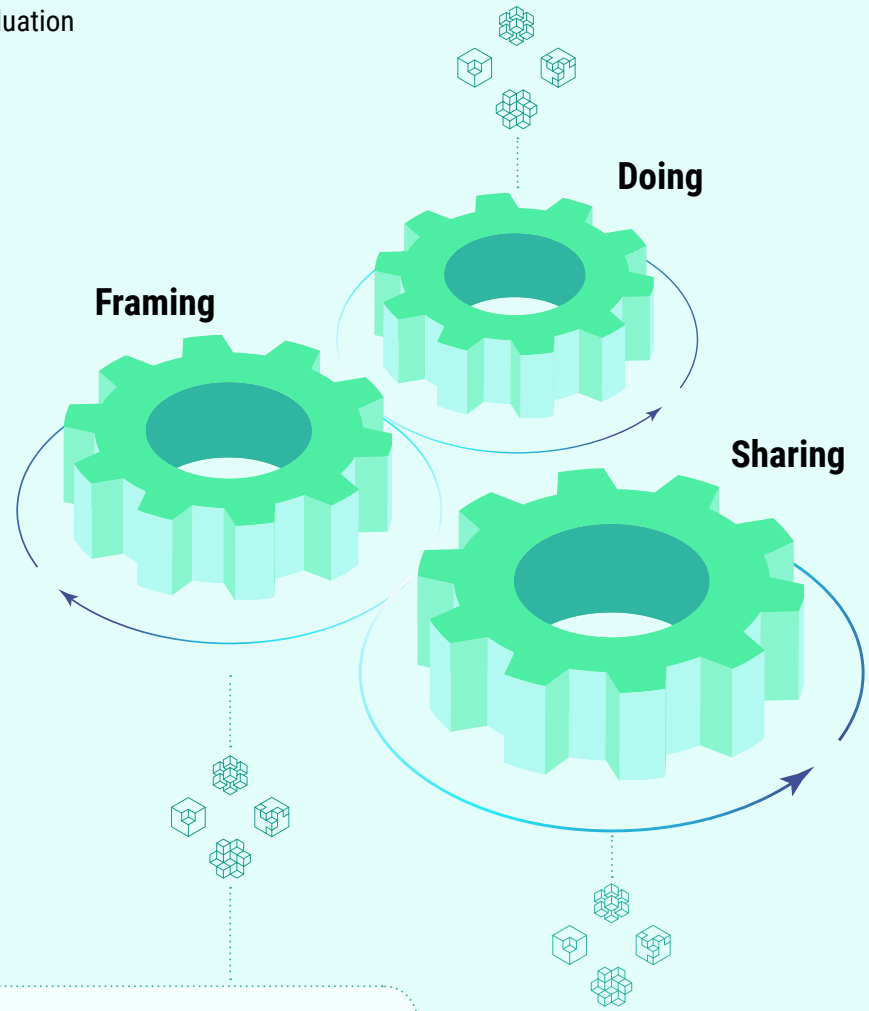
**Getting scaling into research—** Considering the four guiding principles throughout the research process

**Four Guiding Principles**

- Justification
- Optimal Scale
- Coordination
- Dynamic Evaluation

*While* **doing** *research, researchers might ask:*

- *What evidence is needed to determine optimal scale?*
- *How will we involve stakeholders in data collection, analysis/synthesis, and interpretation?*
- *What key moments can we foresee for learning and adaptation?*




*While* **framing** *research, researchers might ask:*

- *Based on the research focus and questions, what potential opportunities might optimize the impact of your research?*
- *Who/what are the people, places, and things that affect and are affected by the scaling process?*
- *Which users and beneficiaries might we consult to understand and justify the research framing and its potential impact?*

*While* **sharing** *research results, researchers might ask:*

- *What strategies will facilitate participation, and contribute to the intended impacts of our research?*
- *Are there particular findings or aspects of our analysis that may be of use to stakeholders beyond those we targeted while doing the research?*

# PART III
## Worksheets

RESEARCHERS MAY consider these worksheets to position a project for scaling. Researchers may also use these questions to guide efforts to build on previous applied research in a project more explicitly focused on scaling. We recommend that you provide initial responses to all questions at the outset of a research project, and then revisit and revise these responses regularly as the research progresses. This is not an exhaustive list, it is a starting place. Integrate your own prompts, and skip-over the questions that don't work in your context.

### A. FRAMING: Focus and questions

| Question | Notes | | | When will you revisit this response? |
|---|---|---|---|---|
| **i)** Based on the research focus and questions, what potential opportunities might optimize the impact of your research? | Opportunities | | Strategies to pursue | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| **ii)** Which users and beneficiaries might you consult to understand and justify the research framing and its potential impact? | Actor | Rationale | Potential implications | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

## Mapping the 'Scaling System'

### INITIATORS

People, places, and things, that make it possible to begin a change in scale— *e.g. funders, knowledge, a willing community.*

### ENABLERS

People, places, and things that can facilitate scaling— *e.g. cultural norms, local leaders, policymakers.*

YOUR PROJECT

### COMPETITORS

People, places, and things that impede, offer a next-best, or better-than alternative, to scaling the innovation— *e.g. alternative innovations, ingrained practices, fragile institutions.*

### IMPACTED

Those who experience the positive or negative results from scaling, and ultimately control success.

## B. DOING: Data collection, analysis/synthesis, and interpretation

| | | | |
|---|---|---|---|
| **i)** Constructing a 'multi-dimensional' view of impact | **How would you describe optimal scale for this dimension of impact? What evidence would demonstrate it to your stakeholders?** | | **When will you revisit this response?** |
| • **Magnitude of the impacts** (e.g. number of people served, quality of change) | | | |
| • **Diversity of the impacts** that the intervention will achieve (e.g. health outcomes, environmental outcomes, financial benefit, etc.) | | | |
| • **Sustainability of the impacts** (e.g. are impacts durable? why or why not?) | | | |
| • **Equity of the impacts** (e.g. do some sub-groups fare better than others? Who wins? Who is left behind?) | | | |
| | | | |
| **ii)** How will you involve stakeholders in data collection, analysis/synthesis, and interpretation? | Stakeholder group | Strategy to engage | |
| | | | |
| | | | |
| | | | |
| **iii)** What key moments can you foresee for learning and adaptation? | Internal (based on research timeline) | External (based on stakeholder needs) | |
| | | | |
| | | | |
| | | | |

## C. SHARING: Communicating research results

| | | | | |
|---|---|---|---|---|
| **i)** What strategies will facilitate participation and contribute to the intended impacts of your research? | Stakeholder group | What lessons might be shared with this stakeholder? How might they be engaged? | | **When will you revisit this response?** |
| | | | | |
| | | | | |
| | | | | |
| **ii)** Are there particular findings or aspects of your analysis that may be of use to stakeholders beyond those you targeted throughout the research? | Stakeholder group | Finding(s) | Strategy | |
| | | | | |
| | | | | |
| | | | | |

# ANNEX
# Case Studies

CASE STUDY N°1

## Nigeria— Home visits to enhance maternal health in Bauchi State [1]

**Issue:** Pregnancy and childbirth in Nigeria are associated with a high rate of mortality. Travelling to health facilities for prenatal care is not always possible for pregnant women, particularly for the poorest and those in rural areas. The quality of care offered at health facilities is also uneven.

**Research topic:** To examine the acceptability and impact of universal home visits to pregnant women and their spouses in randomly selected wards in the Toro Local Government Area of Bauchi state, Nigeria.

**Intervention:** Trained female home visitors from the communities visited pregnant women and talked to them about risk factors for health during pregnancy. Trained male home visitors from the communities visited and spoke with the women's partners about the same issues. The visits also included video 'edutainment'—short video clips addressing maternal health risks through popular soap opera scenarios.

**Anticipated outcomes:** The project helped Nigerian policy-makers and health providers understand how new approaches to in-home care might improve the lives of pregnant women and their children without straining the overburdened health system in the state.

Comparison of the first two wards (visited) and the next two wards (not yet visited) showed that women in the visited wards had fewer complications during pregnancy and after delivery, and they had an improvement in the targeted risk factors. These improvements occurred even though women in the visited wards did not increase their use of health facilities for prenatal care or delivery.

## Scaling

### A— Framing: Focus and questions

***i— Based on the research focus and questions, what potential opportunities might grow the impact of this research?***

When framing and designing the project, the research team was attentive to opportunities to scale the project *within* Bauchi state. The researchers had previously worked with this state government, who prioritised improving maternal health. The research team also recognized that, while it was not within the project scope, if results were positive in the trial of universal home visits in Bauchi, there could be opportunities to scale *beyond* the state level.

***ii— Who/what are the people, places and things (initiators, enablers, competitors, those impacted) that affect and are affected by the scaling process?***

The Bauchi state government played a key role as co-implementers. Their close involvement supported sustainability of the scaling efforts. The team also identified sub-state level government – the Local Government Authorities (LGAs), Toro LGA and others, as important players.

A project steering committee included key stakeholders. The project also developed a close collaboration with the Bauchi State College of Nursing and Midwifery (CONM) to promote the sustainability of the home visits program. The project supported development of a core faculty in CONM to continue training government personnel within the State to manage the home visits program as it expanded.

***iii— Which users and beneficiaries should you consult to understand and justify the research problem and its potential impact?***

**Users:** The research questions addressed essential concerns expressed by planners and policy-makers in the state in formal and informal meetings. Government officers helped design the content of the home visits in a series of design meetings.

**Beneficiaries:** The content of the home visits was based on the team's earlier research on maternal health in Bauchi. A representative household survey found four factors related to maternal morbidity: heavy work in pregnancy, domestic violence, lack of spousal communication about pregnancy and childbirth, and lack of knowledge about danger signs in pregnancy and childbirth. These are all issues that households themselves can act on to reduce risks. The research team developed a questionnaire and discussion guide for the home visits focusing on these issues.

### B— Doing: Data collection, analysis/synthesis, and interpretation

***i— What evidence is needed to determine optimal scale?***

If the visits had a measurable and useful impact on maternal and child health, this would support the wider implementation throughout Bauchi State, and potentially throughout Nigeria. Other considerations included whether the visits were acceptable and endorsed by different sub-groups within communities and were

1. Video Edutainment: Impact on Maternal and Infant Outcomes in Toro, Nigeria (IMCHA) (Project #108039)

cost-effective in improving maternal health. Analysis of these aspects will help determine if and how the program should be scaled.

***ii— How will you involve stakeholders in data collection, analysis/synthesis, and interpretation?***

The project involved Bauchi State government officers and officers from Toro LGA as team members, and trained them to manage and monitor the universal home visits. Trained officers took over implementation of the home visit scheme in two wards during the funded project. The government officers attached to the research team played an active role in data analysis and writing up results. The trained home visitors were women and men nominated from within their own communities, remunerated for the visits they made.

***iii— What key moments can you foresee for learning and adaptation?***

When government health service personnel started to manage the home visits in the first two wards, this provided insights on the feasibility of the home visits as part of a routine service offer. Further, it allowed the team to assess the sustainability of the scaling efforts within the government system. With scaling in mind, the research team considered not only the effectiveness of the home visits in a research context, but also how this effectiveness could be maintained in a wider implementation under non-research conditions.

There were also learning opportunities throughout the project. In a linked project, the team heard from men and women in Bauchi communities their views about child spacing (*kunika* in the Hausa language means lack of adequate child spacing) and co-designed with them a module on *kunika* to include in the evolving content of the home visits.

## C— Sharing: Communicating research results

***i— What strategies will facilitate participation and contribute to the intended impacts of your research?***

The research team highlighted the need to continue monitoring implementation of the home visit as they are rolled out in different communities and contexts. Training of government officers in data-monitoring and quality-control methods, as well as data management, analysis, and reporting, is critical to ensure the sustainability and effectiveness of home visits.

***ii— Are there particular findings or aspects of the analysis that may be of use to stakeholders beyond those you targeted throughout the research?***

With some contextualization, the home visits have the potential to be scaled beyond Bauchi state. Evidence to support the appropriateness of implementing the visits in communities in other Nigerian states is needed for nation-wide scaling.

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This project is a collaboration between the Federation of Muslim Women's Associations in Nigeria; the Community Information for Empowerment and Transparency / Participatory Research at McGill; and the Bauchi State Primary Health Care Development Agency. It is funded under the Innovating for Maternal and Child Health in Africa (IMCHA) initiative, a research partnership between IDRC, the Canadian Institutes of Health Research, and Global Affairs Canada.

CASE STUDY N° 2

### Tanzania—Scaling a nutrition intervention through market mechanisms [2]

**Issue:** In developing countries, vitamin A deficiency is not only a leading cause of blindness in children, but can also increase the health risks associated with diseases such as diarrhea and measles.

**Research topic:** To examine ways to address vitamin A deficiency and investigate the viability of using market mechanisms to increase its consumption in two regions in rural Tanzania suffering from high levels of vitamin A deficiency.

**Intervention:** The project involved small- and medium-sized enterprises fortifying unrefined sunflower oil with vitamin A. To ensure that the Vitamin A-enriched oil could be put on the market, the project started by meeting public safety and quality standards. The project also aimed to test whether eVouchers, electronic coupons downloaded by consumers to their mobile phones, could stimulate the sale of the fortified oil and encourage sustainability of its consumption.

**Outcomes:** The overall results showed that the newly fortified oil contained sufficient levels of vitamin A after having been stored for several weeks by the retailers. Rural consumers accepted this approach and effectively enhanced their Vitamin A uptake.

## Scaling

### A— Framing: Focus and questions

***i— Based on the research focus and questions, what potential opportunities might grow the impact of this research?***

The project manager had developed relationships with a number of small- and medium-sized enterprises producing unrefined sunflower oil commonly used in Tanzania. Around the same time, the Government of Tanzania was drafting mandatory fortification rules that would require certain products be fortified with micronutrients. This presented a potential challenge for producers of unrefined sunflower oil, as there was no established process to fortify unrefined oil at the time. However, there could be a clear opportunity for scaling if the unrefined oil could be successfully fortified and commercialized.

A technical study showed that unrefined sunflower oil could be fortified and maintain shelf-stability for long enough to accommodate the production, transportation, sale, and consumption of the oil before the vitamin A would break down. This research project pursued the potential impact of this finding by testing the businesses' ability to fortify unrefined sunflower oil for local consumption.

***ii— How will you involve stakeholders and beneficiaries in data collection, analysis/synthesis, and interpretation?***

Since the project relied on market mechanisms, it was important to involve manufacturers of sunflower oil in the regions of focus. To deliver the fortified oil to consumers, it was also necessary to identify the network of retailers in the two regions. The government's strategy and regulatory initiatives needed to be identified, deliberated, and navigated to ensure the project's success.

Other actors included the organizations involved in outreach activities who aimed to make refined sunflower oil the preferred choice of consumers. There was also possible competition given that some consumers might prefer imported palm oil, rich in saturated fats, over the fortified sunflower oil. This underlined the importance of consumer outreach activities.

***iii— Who/what are the people, places and things (initiators, enablers, competitors, those impacted) that affect and are affected by the scaling process?***

From its inception meeting, the project tried to incorporate as many local and national stakeholders as possible. This allowed the actors to understand the intent of the work and its position within Tanzania's fortification strategy, and establish relationships to share information as scaling progressed.

Testing the technical feasibility of unrefined sunflower oil fortification at the small- and medium-sized enterprises level required significant outreach. The project needed to identify enterprises that saw the long-term benefits of participation, since businesses needed to install relatively expensive new equipment and had to learn the techniques involved in vitamin A fortification.

The project also needed to coordinate delivery partners' work and accommodate existing market structures and demands. Consumers' pre-established consumption patterns in the two regions also had to be considered as the product was brought to scale.

2. Promoting Locally Fortified Sunflower Oil Using E-Vouchers (CIFSRF 2) (Project # 107790)

## B— Doing: Data collection, analysis/synthesis, and interpretation

*i) What evidence will help to determine optimal scale?*

- Enterprises' abilities to produce a sufficient quantity of fortified oil to satisfy demand in the regions.
- Cost-effectiveness of production.
- Success to disseminate the oil to the target population.
- How well fortifying the oils benefited the lowest-income households (Could they afford the fortified oil, and did the buying incentives work?).
- Impact of the oil to increase vitamin A levels in the target population.

If the visits had a measurable and useful impact on maternal and child health, this would support the wider implementation throughout Bauchi State, and potentially throughout Nigeria. Other considerations included whether the visits were acceptable and endorsed by different sub-groups within communities and were cost-effective in improving maternal health.

*i) How will you involve stakeholders in data collection, analysis/synthesis, and interpretation?*

**Consumers:** Engagement activities at events such as cooking shows to familiarize consumers with the fortified sunflower oil.

**Religious leaders and decision makers:** Strategic engagement with religious leaders and decision-makers on household spending and misconceptions surrounding micronutrient fortification.

**Government:** Capitalize on the Tanzanian government's priority to address vitamin A deficiencies. Involve government representatives in the interpreting the data to increase the chances of further scaling the results.

*iii) What key moments can you foresee for learning and adaptation?*

**Interaction with key stakeholders:** Through interactions with retailers, the research team realized early on that low-income households tended to buy very small amounts of cooking oil, just enough to last one day. To adapt, the project team offered smaller packaging options to consumers.

**Project implementation:** The E-voucher system encountered a number of difficulties, leading the research team to adjust its approach during the project's implementation. They adapted by switching to a retailer-oriented discount called eWallets.

## C— Sharing: Communicating findings and research results

*i) What strategies will facilitate participation and contribute to the intended impacts of your research?*

**Beneficiaries:** The research team collected, monitored, and analyzed data to understand to what extent lower-income populations were able to purchase the oil. This provided useful information for local and national governments on strategies to scale up the results to other regions. The project also monitored the effects of fortified sunflower oil on vitamin A deficiency in the two target regions.

**Users:** The team organized major stakeholder meetings at the end of the project, including various governmental agencies. This provided an opportunity to discuss the project results and what conditions were needed for success. This also had the potential to inform next steps. The dialogue encouraged stakeholders to think how the design of such fortification initiatives could be strengthened.

*ii) Are there particular findings or aspects of the analysis that may be of use to stakeholders beyond those you targeted throughout the research?*

The project tested sustainable business models and strategies to promote vitamin A consumption, and ultimately determined that the fortified oil could reduce micronutrient deficiencies in vulnerable groups. The scope of scaling the impact suggests it is possible to scale to *more regions* than targeted by the project, and also to scale to *more fortified products* to enhance nutrition.

It became apparent that Tanzania's policies and regulations must work hand-in-hand with efforts to enhance nutrition. The regulatory system for any such fortification efforts should be clear and align well with the operation of the enterprises involved in fortification. Coordination is therefore of utmost importance in such scaling efforts.

**This project was led by the Mennonite Economic Development Associates of Canada and funded through the Canadian International Food Security Research Fund, a partnership between IDRC and Global Affairs Canada.**


# RESEARCH STREAM THREE

# *Research Quality Plus (RQ+)*

### *Context*

Traditional methods of assessing the quality of science are falling short, and face increasing scrutiny for their accuracy and results. A particular challenge to the status quo – a challenge supported by the findings of research streams one and two of this dissertation – is that research evaluations can often do more to suppress KT than support it.

Research stream three builds a practical response. The following two chapters present a novel evaluation framework called *Research Quality Plus*, review its implementation across a series of seven IDRC-based evaluations, and provide a quantitative meta-analysis of the aggregate findings. The result is a validated and reproducible evaluation approach that brings KT into any assessment of quality, reimagining how we might encourage applied and translational research.

### *Stream objective*

How might research funders evaluate research quality with KT in mind?

### *Stream research question*

7. Can a conceptual model of 'high quality research' that embraces KT be embedded in a research evaluation framework? If so, what can be learned from its implementation?

**Chapter 7 –**

# *Making a difference in the real world? A meta-analysis of the quality of use-oriented research using the Research Quality Plus (RQ+) approach*

**Summary**

This peer-reviewed publication presents the culmination of the *Research Quality Plus (RQ+)* stream of the dissertation. First, it introduces the central tenets of the RQ+ approach and how they fit against the broader research evaluation literature. Second, it outlines the original iteration of the RQ+ evaluation framework and the details the process of application of the framework in 7 independent evaluation across IDRC. Finally, it compiles the results of the independent evaluations in a single record and provides a quantitative meta-analysis of the aggregate data. The findings of the work are relevant for researchers, research funders, and science policy-makers interested in KT and research for development. Specifically, it produces several novel conclusions about Southern-led science, research capacity building, and KT in research (what we measure hereafter as "positioning for use"). Importantly, the publication validates that funder-led research evaluation can comprise KT. This publication was first drafted as an IDRC working paper (McLean & Sen 2018), and in working paper format, was circulated for peer-review by 12 science systems actors from around the world, including the first author of the Leiden Manifesto.

**Role of the PhD candidate:** As first author of the publication, I designed and conceptualized the underpinning study, I implemented and directed the process of the 7 independent research teams, I designed and led the cross-study synthesis and corresponding quantitative meta-analysis. I drafted the original manuscript, elicited and facilitated feedback from the co-author, and guided the paper through publication in the peer-reviewed journal *Research Evaluation*.

**Reference:** McLean RKD, Sen K. Making a difference in the real world? A meta-analysis of the quality of use-oriented research using the Research Quality Plus approach. *Res Eval*. 2019;28(2):123-135. doi:10.1093/reseval/rvy026.

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# Making a difference in the real world? A meta-analysis of the quality of use-oriented research using the *Research Quality Plus* approach

**Robert K. D. McLean** [1,2]* **and Kunal Sen** [3]

[1]Policy and Evaluation Division, International Development Research Centre, Ottawa, Canada, [2]Faculty of Medicine and Health Sciences, Stellenbosch University, Tygerberg, South Africa and [3]Global Development Institute, University of Manchester, Manchester, UK

*Corresponding author. Email: rmclean@idrc.ca

## Abstract

High-quality, use-oriented, and well-communicated research can improve social outcomes in low- and middle-income countries and, by doing so, accelerate development progress. We provide a meta-analysis of research supported by Canada's International Development Research Centre. We use a large and unique data set that comprises 170 research studies undertaken over the period 2010–2015. The research examined spans multiple disciplines of the social and natural sciences and was conducted across the globe, with the majority in Africa, Asia, Latin America, the Caribbean, and the Middle East. The evaluative framework we use—*Research Quality Plus, RQ+*—incorporates argumentation espoused in the *Leiden Manifesto*. As such, this article presents a case study of doing research evaluation differently and what the results can look like for research policy-makers. Our analysis suggests that contrary to conventional wisdom, there is no clear trade-off between the rigor and the utility of research and that research capacity-strengthening effort is positively correlated with the scientific merit of a project. We conclude that those located closest to a development challenge are generally those best positioned to innovate a solution. The results present novel evidence for those supporting, using, and doing research for development.

**Key words**: meta-evaluation; Southern research; capacity building; research quality; Research Quality Plus.

## 1. Introduction

High-quality research is an indispensable component of economic and social progress. In the Global South, this holds just as true. High-quality, use-oriented, and well-communicated applied natural and social science research can improve economic and social outcomes in Southern countries and, by doing so, accelerate development progress (DFID 2014). In the past several decades, there has been a significant increase in funding from bilateral and multilateral donor agencies to fund research about low- and middle-income countries. For example, the government aid agency of the UK will invest £390 million per year in research in 2017–2020 (DFID 2016). In the USA, the Global Development Lab of the United States Agency for International Development was created in 2014 to work specifically in science and innovation to tackle development challenges (USAID 2017). Philanthropists have become involved too. Take, for example, the *Grand Challenges* initiatives of the Bill and Melinda Gates Foundation and their global propagation (BMGF 2017). At the same time, Southern granting councils are emerging and increasingly active in guiding the direction of scientific research in their own local contexts. For one example, 15 governments across Africa have made commitments to increase expenditure and coordination on science and research as a part of the Science Granting Council Initiative (CREST 2014; SGCI 2016).

Donors can have multiple objectives in funding research in Southern countries. These objectives include enhancing the quality of knowledge generation in the South, building capacity of Southern researchers and research institutions, and supporting research that generates evidence for policy and practice in Southern countries (Carden 2009). Yet, and despite the investment in research for development, there is limited knowledge of how effective the funding of research for development has been with respect to the multiple objectives that are expected of it.

Within the development sphere, but also well beyond it, researchers have extensively debated the best criteria for

determining the quality of natural, social, and behavioral science, and two general postulates have dominated this sphere:

1. First, that measuring the scientific merit of science is the domain of the scientist. Peer review has emerged and developed in line with this postulate, and over the past two decades, peer review has been increasingly supplemented by bibliometric measurement—a surrogate measure of the popularity of research among other researchers (Hicks et al. 2015).
2. Second, is that determining the scientific merit of research does not include assessment of the process and results of research that stretch beyond the realm of the researcher (e.g. capacity strengthening or impact). Broadly speaking, this is because these outcomes of research are seen to be a part of the social realm and beyond the direct system of science (Ofir et al. 2016).

Currently, this tradition of evaluating scientific quality is undergoing significant review and re-questioning. Concerns within the scientific community about the validity and reliability of bibliometric measurement are coupled with an increased desire from funders (public and private) for the demonstration of social impact of research investments (Hicks et al. 2015; Wilsdon et al. 2015; Holmes 2016). For example, the UK Government, in its review of the assessment of quality of research in UK higher education institutions, moved from a system that assessed only research outputs in the Research Assessment Exercise of 2008 to one that also incorporates the assessment of the impact of the research in the Research Excellence Framework of 2014 (Stern 2016). This debate is intertwined with the growth of a body of research that argues that the social value of science is not a matter of research publication and dissemination but, instead, a complex and iterative process of social interactions with research users, beneficiaries, and other intended and unintended stakeholders (Greenhalgh and Wieringa 2011; Bowen and Graham 2015; Nutley, Walter and Davies 2007; D'Este et al. 2018).

As a result, there exists a global and cross-disciplinary re-questioning of whether the methods we use for research evaluation are those best suited for uncovering, measuring, comparing, and, by extension, achieving the potential value of scientific research. But, there is limited evidence of the usefulness of alternate methods of research evaluation.

In this article, we provide a meta-analysis of the quality of research supported by Canada's International Development Research Centre (IDRC), an organization with 48 years' experience funding research for the development priorities of Southern countries. This is a particular subset of the global research enterprise. For IDRC, research for development, or R4D, comprises research activities that aim to find solutions to growth, equity, justice, and efficiency challenges faced in Southern countries. The majority of this research is undertaken in Southern countries by Southern researchers, and it has spanned scientific disciplines from economics to neuroscience, and accepts multi- and transdisciplinary approaches common in fields such as agriculture or climate change. A detailed account of the historical experience of IDRC is available in the article by Muirhead and Harpelle (2010).

We conduct the meta-analysis using the Research Quality Plus (RQ+) approach. We present this analysis as a validation of the effectiveness of the RQ+ approach to research quality evaluation. RQ+ is a novel evaluation methodology that builds on the analytic assessment provided by bibliometrics/altmetrics and the deliberative results of peer review. Furthermore, it incorporates the majority of the theory-driven arguments espoused in the *Leiden Manifesto* (Hicks et al. 2015) into a practical evaluative tool. For example, the RQ+ approach facilitates independent, expert review that is values-driven, inspired by systems thinking, accepting of quantitative and qualitative evidence, and systematic. At the same time, RQ+ moves beyond traditional measures of scientific research rigor, to capture the multiple objectives that underpin the greater potential of research for society, such as research uptake and use, capacity strengthening of researchers and/or research institutions, and the legitimacy of the research to local knowledge and demand.

In the following section of this manuscript, we provide an overview of the RQ+ approach and the RQ+ assessment framework as it was applied at IDRC—our data set's underpinning evaluative framework and eligibility criteria for independent study inclusion in the meta-analysis. In the third section, we provide a description of our methods to conduct the meta-analysis. In the fourth section of the article, we present the findings of our meta-analysis. In the final section, we offer some interpretation of the results and discuss their meaning. We argue that this exercise has offered a quantitatively powerful and a qualitatively rich evidence base to inform decision-making for a diverse range of actors in the research for development system. We are unaware of any data set of research for development quality with a similar explanatory value.

## 2. The RQ+ approach

The RQ+ approach emerged from a body of work undertaken at IDRC since 2012.[1] At the highest level, the RQ+ approach can be described as a stance for evaluating research quality that comprises three fundamental notions. These are introduced in detail below, but in brief are (1) accepting a multidimensional view of quality, (2) gathering contextual understanding, and (3) demanding judgment based on empirical evidence. The RQ+ approach was put into action at IDRC with a bespoke RQ+ assessment framework. A comprehensive description of the RQ+ assessment framework used at IDRC, the rationale for creating the RQ+ approach, as well as reflection on the first implementation of the approach is presented in the article by Ofir et al. (2016). Here we present a summary overview of the approach and the assessment framework, to position our meta-analysis. To our knowledge, the RQ+ approach has been used primarily for the assessment of research for development. We see no reason it would not apply, given appropriate tailoring, outside of this context.

### 2.1 Rationale and purpose for RQ+

At the heart of the operational model of Canada's IDRC is the financing of *research for development*. Simply put, this implies that IDRC-supported research aims for both scientific and societal impact, it is solutions-oriented and it occurs within a diversity of contexts. It is research that is intended to contribute to social and economic development progress in Southern countries. Although the synergies, challenges, and tensions of producing socially relevant and scientifically meritorious research are well described and debated in the academic literature, fewer practical contributions to how this research can be evaluated have been presented, and fewer still have been validated with systematic testing (Greenhalgh et al. 2016; Mendez 2012; Bornmann 2013; D'Este et al. 2018). Accordingly, the RQ+ approach was motivated by IDRC's desire to advance global research evaluation practice and, more

pragmatically, by the need to bring rigor to the assessment of the research it itself supports.

To ground this motivation in the state of the art of research evaluation and the perspectives of IDRC's Southern research community (a group of researchers who are severely underrepresented in research quality and evaluation debates), two foundational studies were conducted. Mendez (2012) undertook a broad literature review of research evaluation frameworks, and Singh et al. (2013) sought to identify and document Southern perspectives of research quality.[2]

Mendez (2012) focused on what constitutes research excellence and on mechanisms to evaluate it. The literature reveals that there is no single definition, standard, or method for research excellence evaluation. Rather, there are many definitions for both research and excellence, there is no agreement on the quality dimensions that should be used to evaluate research, and there are large debates around the mechanisms used to evaluate research excellence (e.g. peer review and bibliometric analysis). This article does not answer questions about which definition or approach is better; instead, it presents the range of arguments and ideas found in the literature.

Singh et al. (2013) undertook an empirical enquiry into how Southern researchers view research excellence and how their experiences can inform the creation of a framework for the assessment of research excellence at IDRC. The study collected primary data through surveys and interviews, and although it did not draw a specific definition of research quality, it presented a novel and useful data set for RQ+ ideation.

As this body of work evolved, so too came a number of high-level calls for reform in the global research evaluation sphere, likely the most impactful of these was the Leiden Manifesto (Hicks et al. 2015). By citing malpractice in the use of metrics for research evaluation and forwarding 10 principles for improvement, the Leiden Manifesto aimed to contribute to advancing science and how it might interact more fluidly with society. This created a powerful backdrop for, and input to, the development of RQ+. As a result, RQ+ is positioned to address the systemic weaknesses in the research evaluation outlined in the Leiden Manifesto and presents one way for moving the principles of the Manifesto into practice.

In sum, IDRC's development of RQ+ stemmed from a number of influences. First, a practical desire to do better at evaluations of research quality at IDRC. Second, a body of research and reflection undertaken by IDRC and its research community from 2012 to 2015. Finally, the backdrop of a global movement calling for reform and improvement across the research evaluation enterprise.

## 2.2 The RQ+ approach holds three tenets

1. *Accept a multidimensional view of quality that is based on the values and objectives that drive a research agenda*: For IDRC, scientific rigor is a non-negotiable, but being interested in research for development, a complete picture of quality moves beyond this traditional measure of rigor to encapsulate research legitimacy, importance, and how the research is positioned for use. To another funder, government, think tank, journal, university, and so on, these quality dimensions may be very different. This is a good thing. As the Leiden Manifesto states, 'the best judgments about the quality of research should be taken by combining robust statistics with sensitivity to the aim and nature of the research that is evaluated' (Hicks et al. 2015).
2. *Research happens in a context, embrace and learn from this*: The predominant forms of research quality assessment aim to isolate research from its environment (e.g., blinded peer review). The RQ+ approach argues that this reductionist method of quality appraisal limits what we come to know about knowledge production processes and results. For instance, considering research not as isolated from but as a product of varying political, organizational, disciplinary, and/or data environments supports a systems-oriented assessment of quality. As the Leiden Manifesto states, '... (research evaluations) should take into account wider socio-economic and cultural contexts. Scientists have diverse research missions.' (Hicks et al. 2015).
3. *As with the research we conduct, judgments should be underpinned by empirical evidence. Not just opinion*: For example, go out and ask the intended users of a research project for their insights and balance these against the voice of the beneficiary community, expert researchers in the same field, and the bibliometrics. It is an unfortunate paradox of the sciences that the most utilized approach to research evaluation rests entirely on opinion. As the Leiden Manifesto states, 'decision-making about science must be based on high-quality processes that are informed by the highest quality data' (Hicks et al. 2015).

## 2.3 The RQ+ assessment framework

The practical manifestation of RQ+ at IDRC is found in the RQ+ assessment framework (IDRC 2017). The framework presents a tool for evaluating research quality in a systematic and transparent way. A postulate of the RQ+ approach is that research evaluation should be tailored to context, and so, it should be cautioned that what is presented hereafter is the framework as it is currently envisioned for IDRC, and how it was constructed and applied in the 2015 evaluations analyzed in this manuscript. Those interested in using the framework should begin with a comprehensive review of its components vis-à-vis their own research objectives, values, and environment.

The RQ+ assessment framework consists of three components: (1) research quality dimensions and subdimensions, (2) contextual factors, and (3) evaluative rubrics. These components are presented in turn hereafter.

### 2.3.1 *Research quality dimensions and subdimensions*

Ofir et al. (2016) describe a benefit of applying an evaluation framework that captured the essence of IDRC values as an increased confidence of the evaluators in the eventual utility of the results. In evaluator jargon, 'what mattered was measured'.

Technically, these values were categorized as research quality dimensions and subdimensions. The four principal quality dimensions in RQ+ as applied in this exercise were (1) research integrity, (2) research legitimacy, (3) research importance, and (4) positioning for use.

*Research integrity* considered the technical quality, appropriateness, and rigor of the design and execution of the research as judged in terms of commonly accepted standards for such work and specific methods, and as reflected in research project documents and in selected research outputs. Reviewers placed specific emphasis on the research design, methodological rigor, literature review, and the relationship between evidence gathered and conclusions reached and/or claims made, in their scoring.

*Research legitimacy* considered the extent to which research results have been produced by a process that took account of the concerns and insights of relevant stakeholders and was deemed procedurally fair and based on the values, concerns, and perspectives of that audience (Cash et al. 2003). This dimension captured legitimacy in terms of who participated and who did not; the process for making choices; how information was produced, vetted, and disseminated; how well knowledge was localized; and if it respected local traditions and knowledge systems. The research legitimacy dimension had four subdimensions: (1) addressing negative consequences, that is, the potentially negative consequences and outcomes for populations; (2) gender responsiveness, that is, how responsive to gender concerns is the project; (3) inclusiveness, that is, whether the project is inclusive of vulnerable populations; and (4) engagement with local knowledge, that is, whether local context and engagement has been a focus of the project.

*Research importance* considered the importance and value to key intended users of the knowledge and understanding generated by the research, in terms of the perceived relevance of research processes and products to the needs and priorities of potential users, and the contribution of the research to theory and/or practice. It had two subdimensions: (1) originality of the research and (2) the relevance of the research.

*Positioning for use* considered the extent to which the research process has been managed, and research products/outputs prepared in such a way that the probability of use, influence, and impact was enhanced. The incorporation of this dimension in the RQ+ framework was guided by the understanding that the uptake of research is inherently a political process and that preparing for it therefore requires attention to user contexts, accessibility of products, and 'fit for purpose' engagement and dissemination strategies. It also requires careful consideration of relationships to establish before and/or during the research process, and the best platforms for making research outputs available to given targeted audiences and users, and, therefore, requires strategies to integrate potential users into the research process itself wherever this is feasible and desirable.

Figure 1 presents a visual representation of the multidimensional nature of research quality expressed in the RQ+ approach (it includes the dimension of research integrity and all subdimensions).

### 2.3.2 *Contextual factors*

Contextual factors—either within the research endeavor or in the external environment—are issues that hold the potential to affect (positively or negatively) the quality of the research. The RQ+ framework identifies five main contextual factors.

The first is *the maturity of the research field*, which is the extent to which well-established theoretical and conceptual frameworks exist and from which well-defined hypotheses have been developed and subjected to testing, as well as a substantial body of conceptual and empirical research in the research field.

The second factor is *research capacity strengthening*, which is the extent to which the research endeavor or project focuses on strengthening research capacities through providing financial and technical support to enhance capacities to identify and analyze development challenges and to conceive, conduct, manage, and communicate research that can address these challenges.

The third factor is *risk in the research environment*, which is the extent to which the organizational context in which the research team works is supportive of the research, where 'supportive' refers, for example, to institutional priorities, incentives, and infrastructure.


**Figure 1.** Research quality as multidimensional.
*Source*: McLean and Feinstein (2016).

The fourth factor is *risk in the political environment*, which is the extent of external risk related to the range of potential adverse factors that could arise as a result of political and governance challenges and that could affect the conduct of the research or its positioning for use. These range from electoral uncertainty and policy instability to more fundamental political destabilization, violent conflict, or humanitarian crises.

The final factor is *risk in the data environment*, which is the extent to which instrumentation and measures for data collection and analysis are widely agreed upon and available, and the research environment is data-rich or data-poor.

Figure 2 presents an illustration of research quality as a context-bounded and dynamic concept.

### 2.3.3 *Evaluative rubrics*

The final component of RQ+, *the evaluative rubrics*, sets judgement criteria for reviewers, clarifying how performance should be measured for each dimension and subdimension of research quality and each contextual factor. The rubrics were a feature that facilitated the blending of qualitative and quantitative evidence into a single evaluative assessment (Ofir et al. 2016). The standardized rubrics facilitated the systematic approach to evaluation judgement that allowed for the meta-analysis that follows in this manuscript.

In terms of research quality dimensions and subdimensions, the rubrics used graduated levels of achievement. Each subdimension for research legitimacy, research importance, and positioning for use and the principal dimension of research integrity was scored from 1 to 8, with scores of 1 or 2 indicating unacceptable levels of achievement, scores of 3 and 4 less than acceptable, scores of 5 and 6 acceptable to good, and scores of 7 and 8 very good achievement. Once scores were arrived for the subdimensions of research legitimacy, research importance, and positioning for use, they were aggregated to arrive at an overall score for the relevant dimension.

For contextual factors, reviewers made ratings using a three-point rubric. For the three contextual factors related to risk in the


**Figure 2.** The dynamism of research quality.
*Source*: Ofir et al. (2016).

political, research, and data environment, and for the contextual factor related to maturity of the research field, projects scored 1 when exhibiting low risk or high maturity in the field, 2 for medium risk and maturity, and 3 for high risk or low maturity accordingly. Projects where research capacity strengthening was of low focus scored 1, projects scored 2 when of medium focus, and projects scored 3 when a high focus was placed on capacity strengthening.

In Figure 3, we provide an example of the rubric for the RQ+ subdimension: engagement with local knowledge.

Figure 4 outlines a complete picture of the RQ+ assessment framework.

## 3. Methods

The methods section of the article is presented in two parts. First, we outline the process we undertook to select studies and aggregate data to conduct the meta-analysis. Second, we present our overarching approach to statistical analysis.

### 3.1 Meta-analysis and sample overview

Meta-analysis is a technique that collates the results of multiple scientific studies into a single record; statistical methods are then applied to the analysis of the amalgamated data set, doing so to increase the point precision and generalizability of results (Liu 2015; Gurevitch et al. 2018).

In 2015, seven external evaluations of IDRC supported research—which had embedded the RQ+ approach—were completed. The RQ+ data from these seven evaluations comprise the metadata we analyze and present in this article. The systematic use of the RQ+ approach allowed valid quantitative aggregation.

Each assessment of quality made in each of these seven evaluations was derived by a team of three independent subject matter experts and reported publically in formal evaluation reports (these are available in IDRC Digital Library 2017). To arrive at the scores for the RQ+ rubric, for each project, the experts conducted desk-based reviews of project documentation (including research outputs and publications) and conducted interviews of the project staff responsible for administering the projects, researchers involved in the project, and key research users (such as policymakers in Southern countries and senior staff in bilateral and multilateral development agencies). The RQ+ approach aimed to increase validity and accuracy by requiring reviewers to go beyond an assessment of the project output (e.g. publication) to collect and triangulate data from various primary and secondary sources. To facilitate a neutral

**Dimension 2: Research Legitimacy; Subdimension 2.4: Engagement with Local Knowledge**

| NOT APPLICABLE | UNACCEPTABLE | | LESS THAN ACCEPTABLE | | ACCEPTABLE TO GOOD | | VERY GOOD | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| The nature of the research is such that local knowledge and engagement do not need to be taken into account. | Engagement with local contexts has been neglected during the research process. Several major weaknesses can be found, related to how research needs and questions were identified, local communities or populations engaged, local contexts and knowledge systems considered, and local benefits from the research process assured. | | Local contexts and engagement have been considered during the research process, but some weaknesses remain related to how research needs and questions were identified, local communities or populations engaged, local contexts and knowledge systems considered, and/or local benefits from the research process assured. | | Local context and engagement have been a focus in the research process. Few, if any, minor weaknesses remain related to how research needs and questions were identified, local communities or populations engaged, local contexts and knowledge systems considered, or local benefits from the research process assured. | | Local context and engagement have been a clear and systematic focus in the research process. Research needs and questions were appropriately identified, local communities or populations engaged, local contexts and knowledge systems considered and respected, and local benefits from the research process assured. | |

**Figure 3.** Example of the evaluative rubric for engagement with local knowledge.
*Source*: Ofir et al. (2016).

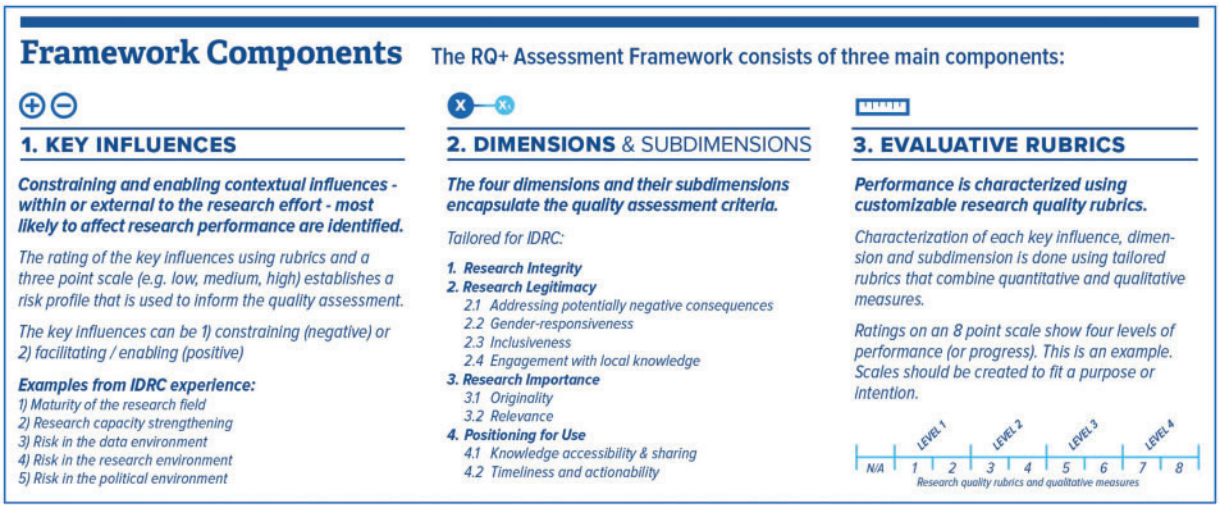


**Figure 4.** The components of the IDRC-tailored RQ+ assessment framework.
*Source*: Ofir et al. (2016).

and independent review, the external review team selected and implemented the approach to collecting and synthesizing these data on their own terms. Processes used across the seven evaluations were not entirely similar. In some cases, surveys of research-user groups were used, and in others, in-depth interviews with beneficiaries.[3]

The aggregate metadata includes 170 components from 130 discretely funded research projects funded by IDRC between 2010 and 2015. The areas of the research ranged from climate change, water, and health, to governance, justice, and economics. The research happened around the world; the majority in Africa, Asia, the Caribbean, Latin America, and the Middle East. The types of institutions that were involved in the research were universities, research institutes, government agencies, and nongovernmental organizations.

Using IDRC records, we cross-tabulated four demographic variables (project financial size, region, multiple funders or not, and institution type), project by project, into this data set.

We are unaware of any data set tracking research for development that matches this magnitude, depth, and breadth.

### 3.2 Statistical analysis

We first analyzed the data using summary statistics—mean, standard deviation, and minimum and maximum values of each RQ+ dimension/subdimension score for the 170 components.[4] We next conducted one-way analysis of variance (ANOVA) tests for different categorizations of the grants—by region, by recipient institution, and by broad region—to assess whether there are significant differences in the means of RQ+ dimensions across the various categorizations.[5] We conducted omnibus $F$ tests where the null hypothesis of no difference between the means of the population subsamples was tested across each data categorization. If the null hypothesis is rejected, then we can infer that at least one of the population subsamples is different from the other means. However, the $F$ test cannot tell us which mean is different from the others. To find out which means are different, we used a multicomparison method—the Tukey $t$-test—that allows us to test which mean of a specific RQ+ dimensions for a particular population subsample is different from the means of the same RQ+ dimension for the other population subsamples. The test compares the difference between

**Table 1.** Results of RQ+ analysis for the entire sample

| RQ+ components | Number of observations | Mean | Standard deviation | Minimum | Maximum |
|---|---|---|---|---|---|
| RQ+ contextual factors | | | | | |
| Maturity of the research field | 170 | 1.78 | 0.68 | 1 | 3 |
| Research capacity strengthening | 166 | 2.14 | 0.81 | 1 | 3 |
| Risk in the data environment | 170 | 1.78 | 0.72 | 1 | 3 |
| Risk in the research environment | 169 | 1.70 | 0.70 | 1 | 3 |
| Risk in the political environment | 169 | 1.71 | 0.77 | 1 | 3 |
| RQ+ dimensions | | | | | |
| 1. Research integrity | 169 | 5.81 | 1.70 | 1 | 8 |
| 2. Research legitimacy | 63 | 5.67 | 1.58 | 1 | 8 |
| 2.1 Addressing negative consequences | 76 | 5.37 | 1.92 | 1 | 8 |
| 2.2 Gender responsiveness | 125 | 4.81 | 2.17 | 1 | 8 |
| 2.3 Inclusiveness | 124 | 5.59 | 2.06 | 1 | 8 |
| 2.4 Engagement with local knowledge | 148 | 6.29 | 1.55 | 1 | 8 |
| 3. Research importance | 165 | 6.35 | 1.32 | 1 | 8 |
| 3.1 Originality | 165 | 5.98 | 1.60 | 1 | 8 |
| 3.2 Relevance | 165 | 6.71 | 1.35 | 1 | 8 |
| 4. Positioning for use | 157 | 5.77 | 1.49 | 1 | 8 |
| 4.1 Knowledge accessibility and sharing | 160 | 5.94 | 1.57 | 1 | 8 |
| 4.2 Timeliness and actionability | 165 | 5.65 | 1.71 | 1 | 8 |

each pair of means with appropriate adjustment for the multiple testing.

Finally, we calculated correlation coefficients across and between contextual factors in the RQ+ framework and RQ+ dimension/subdimension scores to assess the relationship within and between contextual factors and research quality. We used nonparametric Spearman correlations due to the ordinal nature of the data. The level of significance was set at 5%. The analysis was undertaken using STATA version 14.0.

## 4. Results

We begin with an examination of the key influences on the research in the 170 cases. We find that there was a strong focus on research capacity strengthening, with the highest score among the five key influences (a mean of 2.14; Table 1). For the other key influences, most projects were in established or emerging fields, or low to medium risk.

Turning to the RQ+ dimensions, the highest level of achievement was observed for research importance, with an average of 6.71, suggesting the average project in the sample was judged very good in this dimension. In contrast, the average scores for research integrity, research legitimacy, and positioning for use were 5.81, 5.67, and 5.77, respectively. Within the research legitimacy dimension, gender responsiveness has the lowest level of achievement, with a mean of 4.81, and engagement with local knowledge has the highest level of achievement, with a mean of 6.29.[6] Within the research importance dimension, relevance has a significantly higher score of 6.71, as compared with the originality subdimension 5.98. Within the positioning for use dimension, there is little difference in the level of achievements of the two subdimensions—knowledge accessibility and sharing and timeliness and actionability with scores of 5.94 and 5.65, respectively.

When we disaggregate the RQ+ dimensions by regions, we find that the highest levels of achievement are in Latin America, whereas the lowest levels of achievement are in sub-Saharan Africa for research legitimacy and research importance and in Asia for research integrity and positioning for use (Figure 5).

Disaggregating the RQ+ dimensions by recipient institution type, we find the average score for research integrity highest for research institutions; for research legitimacy, it was highest for Non-Government Organizations (NGOs)/International Non-Government Organizations (INGOs); and for research importance, it was the highest for research institutions (Figure 6). For the positioning for use dimension, we find the highest score for the combination of multiple types of organization working together.

Categorizing the grants by the broad region where the researchers are located (South, North, and both regions), we find that Southern projects have the highest scores in all RQ+ main dimensions (Figure 7).

We next present results of the ANOVA tests. We begin with conducting ANOVA tests on the means of RQ+ dimensions by region. We find that the null of no difference in means across regions for research integrity and research importance can be rejected, but not for research legitimacy and positioning for use (Table 2). However, when we do pairwise comparison of means, we find that the *t*-ratio on difference in means for Asia as compared with Latin America is significant in the case of research integrity (with the mean for Asia lower than the mean for Latin America), and the *t*-ratio for the difference in means for sub-Saharan Africa as compared with Latin America is significant for research importance (again, with the mean for sub-Saharan Africa lower). No other *t*-ratios on difference in regional means by RQ+ dimension are significant at conventional levels of significance.

Conducting ANOVA tests on the means of RQ+ dimensions by recipient institution type, we find that the null of no difference in means across regions for research integrity can be rejected, but not for research legitimacy, research importance, and positioning for use (Table 3). The only *t*-ratios for difference in means by RQ dimension that are significant are for NGOs versus research institutions (the mean for NGOs is lower) and for multiple recipients versus research institutions (the mean for multiple recipients is lower).

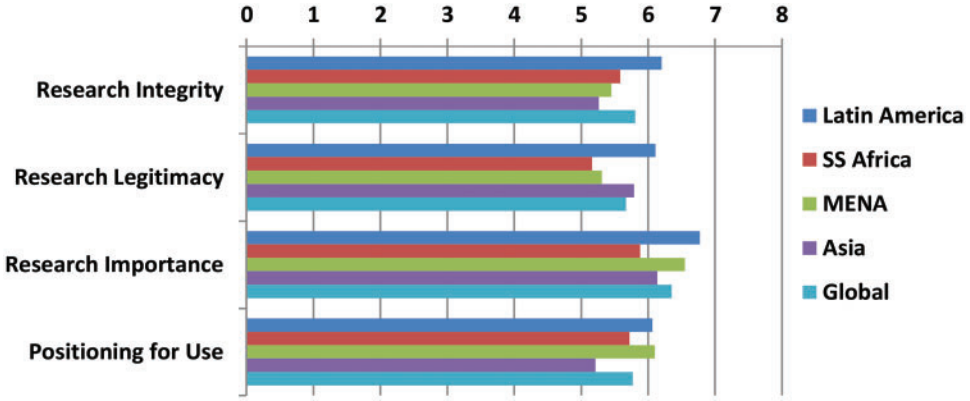


**Figure 5.** RQ+ quality dimensions by region of research focus.
*Note*: Total sample = 170. Within this: Latin America and the Caribbean = 54, Sub-Saharan Africa = 36, Middle East and North Africa = 11, Asia = 39, Global = 30.

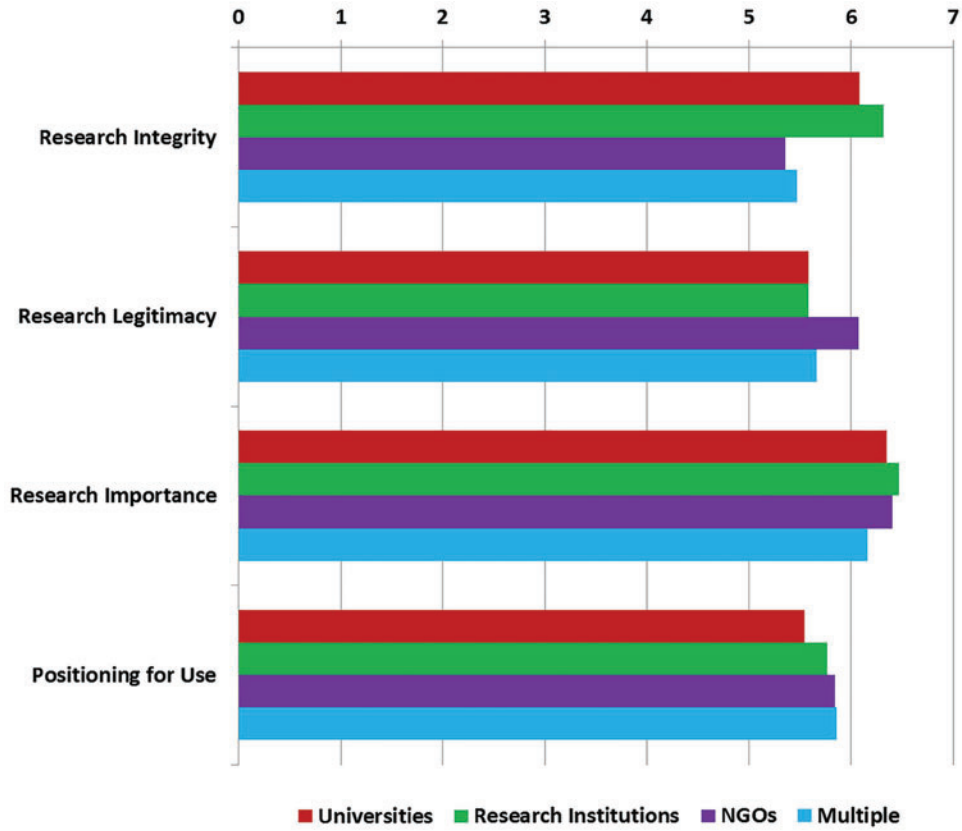


**Figure 6.** RQ+ quality dimensions by recipient institution type.
*Notes*: 1) Total sample = 170. Within this: universities = 33, research institutions = 50, NGOs = 44, Multiple = 43. 2) 'NGOs' includes INGOs. 3) 'Multiple' includes any combination of two or more recipient types working together.

Conducting ANOVAs on the means of RQ+ dimensions by broad regions, we find that the null of no difference in means in RQ+ dimensions cannot be rejected, indicating that there is no statistically significant difference between the means of RQ+ dimensions by broad region (Table 4).

We then examine the correlations between the contextual factors and RQ+ quality dimensions to see if contextual factors within the research endeavor or in the external environment have any influence on research quality. We find strong correlation between research capacity strengthening and research importance (a correlation coefficient of 0.40 and significant at 5% level) and between research capacity strengthening and research legitimacy (correlation coefficient of 0.34 and significant at the 5% level; Table 5). There is a negative correlation between risk in the research environment, on the one hand, and research integrity, research importance, and positioning for use, on the other hand. There is weaker correlation between other key influences and the main RQ+ dimensions.

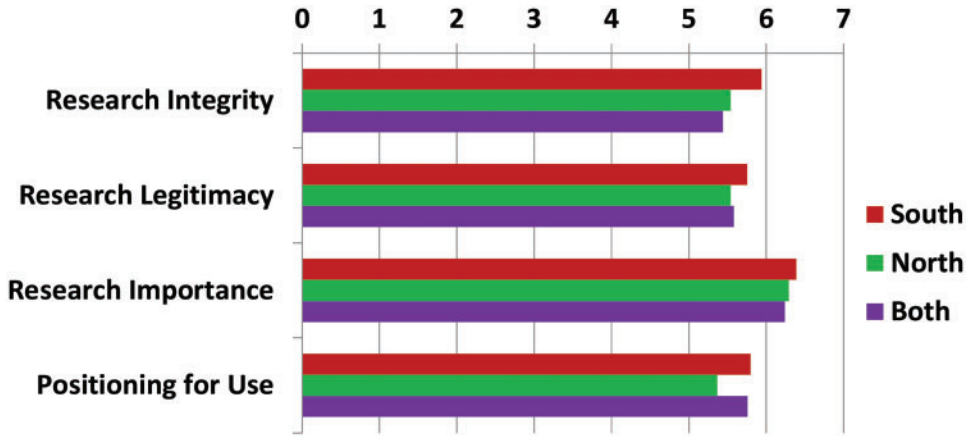


**Figure 7.** RQ+ quality dimensions by broad region of research.
*Note*: Total sample = 170. Within this: North = 26, Both = 25, South = 119.

**Table 2.** Are the means of main research dimensions across regions the same?

| Regional comparisons | Research integrity | Research legitimacy | Research importance | Positioning for use |
|---|---|---|---|---|
| Sub-Saharan Africa vs. Latin America | −1.71 | −1.75 | −3.22** | −1.05 |
| Middle East and North Africa vs. Latin America | −1.34 | −0.91 | −0.50 | 0.08 |
| Asia vs. Latin America | −2.67* | −0.63 | −2.30 | −2.63 |
| Global vs. Latin America | 0.10 | −0.78 | −1.28 | 0.63 |
| Middle East and North Africa vs. sub-Saharan Africa | −0.22 | 0.18 | 1.47 | 0.72 |
| Asia vs. sub-Saharan Africa | −0.85 | 1.19 | 0.86 | −1.44 |
| Global vs. sub-Saharan Africa | 1.58 | 0.41 | 1.63 | 0.31 |
| Asia vs. Middle East and North Africa | −0.35 | 0.55 | −0.90 | −1.69 |
| Global vs. Middle East and North Africa | 1.33 | 0.16 | −0.33 | −0.48 |
| Global vs. Asia | 2.41 | −0.38 | 0.82 | 1.67 |
| *F*-test on whether means by regions are the same | 3.67** | 0.86 | 2.93** | 1.84 |

*Notes*: ** and * indicate whether *t*-statistic/*F*-statistic is significant at 5%, or 10% level of significance. In each cell, the means of RQ main dimensions by regions are compared, and *t*-statistics of pairwise comparisons of means are reported in each row, except last row, where *F*-statistic on whether means are different across region is reported. Positive values of *t*-statistics indicate that mean of first group compared is higher than the second group; negative values indicate the opposite. Tukey's method is used to calculate *t*-statistics.

**Table 3.** Are the means of main research dimensions across recipient institutions the same?

| Institutional comparisons | Research integrity | Research legitimacy | Research importance | Positioning for use |
|---|---|---|---|---|
| Research institution vs. university | 0.62 | −0.80 | 0.41 | 0.68 |
| NGO vs. university | −1.92 | 0.90 | 0.15 | 0.84 |
| Multiple vs. university | −1.61 | 0.14 | −0.62 | 0.90 |
| NGO vs. research institution | −2.80** | 1.60 | −0.27 | 0.18 |
| Multiple vs. research institution | −2.46* | 0.94 | −1.13 | 0.24 |
| Multiple vs. NGO | 0.33 | −0.80 | −0.82 | 0.06 |
| *F*-test on whether means by recipient institutions are the same | 3.57** | 0.88 | 0.45 | 0.32 |

*Notes*: ** indicates whether *t*-statistic/*F*-statistic is significant at 5%, level of significance. In each cell, the means of RQ main dimensions by recipient institution are compared, and *t*-statistics of pairwise comparisons of means are reported in each row, except last row, where *F*-statistic on whether means are different across recipient institution is reported. Positive values of *t*-statistics indicate that mean of first group compared is higher than the second group; negative values indicate the opposite. Tukey's method is used to calculate *t*-statistics.

Between RQ+ main dimensions, we find strong associations between these measures, with correlation coefficients in the range of 0.4–0.7, and statistically significant. This suggests that projects that score highly in one main dimension also score highly in other dimensions (Table 5).

With respect to the correlation between contextual factors and RQ+ subdimension measures (Table 6), we find limited evidence of strong associations, with the exception of a strong correlation between research capacity strengthening and originality (correlation coefficient of 0.45 and statistically significant).

**Table 4.** Are the means of main research dimensions across broad regions the same?

| Broad regional comparisons | Research integrity | Research legitimacy | Research importance | Positioning for use |
|---|---|---|---|---|
| North vs. South | −1.61 | −1.02 | −0.88 | −0.57 |
| Both vs. South | −0.27 | −0.65 | −0.86 | 0.01 |
| Both vs. North | 1.04 | 0.25 | 0.00 | 0.44 |
| *F*-statistic on whether means by broad regions are the same | 1.30 | 0.10 | 0.28 | 0.10 |

*Notes*: In each cell, the means of RQ main dimensions by broad regions are compared, and *t*-statistics of pairwise comparisons of means are reported in each row, except last row, where *F*-statistic on whether means are different across broad region is reported. Positive values of *t*-statistics indicate that mean of first group compared is higher than the second group; negative values indicate the opposite. Tukey's method is used to calculate *t*-statistics. Where $N = 170$ and is composed of: South = 119, North =26, both = 25.

**Table 5.** Correlations between key influences and RQ+ main dimensions

| | Mat | Cap | RiskD | RiskR | RiskP | Resint | Resleg | Resimp | Posuse |
|---|---|---|---|---|---|---|---|---|---|
| RQ+ contextual factors | | | | | | | | | |
| Mat | 1.00 | | | | | | | | |
| Cap | 0.03 | 1.00 | | | | | | | |
| RiskD | −0.08 | −0.04 | 1.00 | | | | | | |
| RiskR | −0.05 | −0.20* | 0.52* | 1.00 | | | | | |
| RiskP | 0.10 | −0.06 | 0.18* | 0.35* | 1.00 | | | | |
| RQ+ dimensions | | | | | | | | | |
| Resint | 0.02 | 0.25* | −0.14 | −0.25* | 0.01 | 1.00 | | | |
| Resleg | −0.09 | 0.34* | −0.05 | −0.05 | 0.03 | 0.43* | 1.00 | | |
| Resimp | 0.15 | 0.40* | −0.14 | −0.20* | 0.17* | 0.59* | 0.69* | 1.00 | |
| Posuse | 0.12 | 0.27* | −0.04 | −0.29* | −0.03 | 0.50* | 0.48* | 0.63* | 1.00 |

*Notes*: Correlation coefficients in cells. Mat = maturity of research field; Cap = research capacity strengthening; RiskD = risk in the data environment; RiskR = risk in the research environment; RiskP = risk in the political environment; Resint = research integrity; Resleg = research legitimacy; Resimp = research importance; Posuse = positioning for use. * indicates significance at 5% level or less.

## 5. Discussion

This study provided a meta-evaluation of the quality of research supported by Canada's IDRC. The analysis was based on a large and unique data set that comprises 170 independent, third-party expert reviews of research projects supported over the period 2010–2015, spanning scientific disciplines and regions of the globe. In the previous section we provided our analysis technique and results. Based on these results, we draw the following inferences about research for development:

1. Our results show that scientifically excellent research is useful research. Conventional wisdom suggests a trade-off between the rigor and the utility of research. In other words, the policy-making can move too quickly to wait for the best designed and executed scientific studies. In our analysis, a strong positive correlation between research integrity and positioning for use suggests the opposite. We suggest that this provides evidence for great attention to scientific integrity for those investing in research to achieve development outcomes.
2. We find that in research for development, risk and opportunity are diversified. The incidence of internal and external environmental contextual factors is mixed across regions and disciplines, and there is little evidence of correlation between these factors. Traditional assumptions about the generalized risk of undertaking research in the South are disputed with these data. Instead, the environment is similar to the science and research environment of the global North, where risk and opportunity are considered on a case-by-case basis. We suggest that this implies idiosyncratic funding program design and funding decisions, attention to contextual detail in monitoring and evaluation of research projects, and the avoidance of sweeping risk assessment claims regarding research for development led in the South.
3. At the same time, we find that research context indicates some broad trends in terms of correlation with research quality. In other words, knowing more about the environment in which research takes place can help one to understand the quality it achieves. For instance, risk in the research environment is overall negatively associated with research quality, and so too is risk in the data environment. Whereas, risk stemming from an immature field and/or capacity strengthening is in fact generally positively correlated to quality, and quite strongly in the case of capacity-strengthening efforts. Political environments have little correlation to quality, except when it comes to the importance of research where positive (though weak) association with quality is evident. We suggest this furthers the case for thoughtful review of research environments, to fully understand quality determinants and draw reasonable conclusions on the quality of any research process.
4. Our results indicate that capacity-strengthening efforts are positively correlated with the quality of research projects, including with scientific integrity. This contradicts a potent assumption—that research requiring attention to training and support to skills development will also be poor-quality research. We suggest an implication being that research which requires or includes a focus on capacity strengthening should not be avoided due to a desire for excellence in traditional views of scientific rigor.
5. We find several compelling correlation coefficients relate to capacity strengthening and research originality (a subdimension of research importance). Max Planck famously noted that, 'A new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die, and a new generation grows up that is familiar with it.' Our finding seems to provide support to the hypothesis that innovative, original research is undertaken by those who are new to a field.[7] A strong positive correlation between the effort spent on capacity building and originality of research supports this. Further, we find that research capacity-strengthening effort is positively correlated with the scientific merit of a project. But, our analysis demonstrates a particularity about Planck's assertion he may have overlooked. The only factor more strongly correlated to originality of science than the fact it

**Table 6.** Correlation matrix between key influences and RQ+ subdimensions

| | Mat | Cap | RiskD | RiskR | RiskP | ResInt | Addneg | Genres | Inc | Lockn | Orig | Rel | Know | Timel |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RQ+ contextual factors | | | | | | | | | | | | | | |
| Mat | 1.00 | | | | | | | | | | | | | |
| Cap | 0.08 | 1.00 | | | | | | | | | | | | |
| RiskD | −0.04 | 0.05 | 1.00 | | | | | | | | | | | |
| RiskR | −0.05 | −0.20* | 0.52* | 1.00 | | | | | | | | | | |
| RiskP | 0.10 | −0.06 | 0.19* | 0.35* | 1.00 | | | | | | | | | |
| RQ+ subdimensions | | | | | | | | | | | | | | |
| Resint | 0.02 | 0.25* | −0.14 | −0.25* | 0.01 | 1.00 | | | | | | | | |
| Addneg | 0.05 | 0.36* | −0.11 | −0.13 | 0.07 | 0.39* | 1.00 | | | | | | | |
| Genres | −0.14 | 0.03 | −0.06 | −0.01 | 0.12 | 0.22* | 0.41* | 1.00 | | | | | | |
| Incl | −0.21* | 0.10 | −0.10 | −0.03 | 0.11 | 0.36* | 0.44* | 0.71* | 1.00 | | | | | |
| Lockn | 0.01 | 0.28* | −0.19* | −0.27* | −0.07 | 0.51* | 0.42* | 0.39* | 0.57* | 1.00 | | | | |
| Orig | 0.18 | 0.45* | −0.13 | −0.16* | 0.13 | 0.56* | 0.45* | 0.31* | 0.36* | 0.54* | 1.00 | | | |
| Rel | 0.08 | 0.25* | −0.12 | −0.20* | 0.18* | 0.48* | 0.55* | 0.40* | 0.39* | 0.47* | 0.60* | 1.00 | | |
| Know | 0.02 | 0.22* | −0.01 | −0.21* | 0.08 | 0.36* | 0.35* | 0.22* | 0.32* | 0.38* | 0.40* | 0.53* | 1.00 | |
| Timel | 0.21 | 0.21 | −0.13 | −0.29 | −0.08 | 0.46 | 0.43 | 0.21* | 0.32* | 0.51* | 0.52* | 0.59* | 0.67* | 1.00 |

*Notes*: Mat = maturity of research field; Cap = research capacity strengthening; RiskD = risk in the data environment; RiskR = risk in the research environment; RiskP = risk in the political environment; Resint = research integrity; Addneg = addressing negative consequences; Genres = gender-responsiveness; Inc = inclusiveness; Lockn = engagement with local knowledge; Orig = originality; Rel = Relevance; Know = knowledge accessibility and sharing; Timel = timeliness and actionability. * indicates level of significance at 5% level or less.

is being undertaken by new researchers is the degree to which the research is incorporating local knowledge (a subdimension of research legitimacy). In other words, those most closely linked to a problem appear best placed to innovate a solution to it.[8]

6. We find that Southern research demonstrates high quality, in all RQ+ dimensions. In fact, Southern research demonstrates superior research quality to Northern research[9] and to partnered North–South research. This is not to say that the research happening in the South is categorically better than the North. It is important to recall the data set examined in this study comprised research projects with objectives to improve social outcomes in the global South. As such, this analysis demonstrates the validity of Southern-led research *for* development. When a problem is local, locals appear best placed to address it. Further to this, we suggest that North–South research partnerships may hold great value for interdisciplinary expansion, internationalization of science, and shared problem-solving. However, we should not assume that Northern partners are improving the capacity of Southern ones or improving the quality of the science undertaken. Rather, North–South partnerships should be predicated on mutually strategic benefits.

### 5.1 Limitations

A comprehensive discussion of limitations of the RQ+ approach to evaluating research, and the limitations of the seven RQ+ external evaluations undertaken in 2015 that have been aggregated for this meta-analysis, is provided in Ofir et al. (2016).

Here we note limitations of our meta-analysis.

1. First, we note that a bias was existent, and entirely intentional, in the construction of the dimensions and contextual factors examined. We have measured and thus highlighted elements that are particularly important to IDRC. We forgo the analysis of other dimensions of quality in doing so. For an example, we stake no claim about researcher or research project 'productivity', which is a common measure of research project success and is widely defined as the number of research outputs per unit. We measure what has mattered primarily to IDRC.
2. We hold concern that the comprehensive nature of the RQ+ approach has yielded meta-analysis that is, on the one hand, unique and path-breaking, but, on the other hand, setting a high bar. We admit concern that the examination of these comprehensive sets of variables may lead to the development of another set of challenges for researchers and research organizations wishing to assess the quality of their work.
3. We suggest the metadata examined could be diversified and the learning potential amplified by the inclusion of projects supported by alternative funders. For the reason identified in the first limitation, or for others that are yet to be uncovered, there may be implicit bias in the data that we cannot identify without source comparison. To mitigate this limitation, we openly call on other funders to replicate or reproduce the study approach.
4. Finally, we note the limitations of this meta-study emerging from our strictly quantitative approach. In future iterations, the synthesis of qualitative data will lend significant value to unpacking the meaning behind study results identified in a quantitative approach. Quantitative meta-analysis has helped us to identify relationships between variables; qualitative synthesis may help us to understand *how* and *why* these relationships hold. In future applications of RQ+ at IDRC, and synthesis of findings, we will aim to undertake quantitative and qualitative synthesis. There is much to learn by doing so.

## Notes

1. See, for example, Lebel and McLean (2018), McLean (2018), Ofir (2016), Ofir et al. (2016), Singh et al. (2013), and Mendez (2012).
2. We recommend these studies for readers seeking to more fully deconstruct the underpinnings of the RQ+ approach. For the purposes of presenting our analysis of RQ+ metadata, we do not unpack the literature and empirical review they provide in this manuscript.

3. We note that the decision on what evidence was required to reach a judgment on any particular dimension was left to the expert opinion of each external review team. IDRC provided teams with a package of research outputs and a list of relevant stakeholders for each independent project in the sample. How these data were interrogated and weighed was independently decided upon by the reviewers to ensure neutrality. Reviewers were allowed and encouraged to move beyond the initial resources provided by IDRC.
4. The score for each main dimension for each of the 170 components was obtained by taking the simple average of the individual scores for each subdimension that was part of the main dimension. For example, to obtain the score for positioning for use, the average of the scores for knowledge accessibility and sharing and timeliness and actionability was obtained. If there were no scores for any of the subdimensions, that particular score was not computed for the corresponding dimension. That is to say there was no downward bias on aggregate scores from a null or zero score being assigned before aggregation.
5. We preferred ANOVA over multivariate regression methods (such as ordinary least squares) in our analysis of the data because the former approach makes less stringent assumptions on the structure of the data (e.g. ANOVA does not assume that the explanatory variables are not collinear).
6. Note that there were fewer observations available for research legitimacy than for the other dimensions. This is primarily due to the fact that reviewers did not score the subdimension 'Addressing Negative Consequences', as this subdimension was deemed 'not applicable' or 'unable to assess' in the projects that were being reviewed. As noted in text earlier, in our meta-analysis, this does not lead to downward bias aggregate scores for any dimension.
7. It should be noted that even those who are not new to a field may also undergo capacity building, though this is less likely.
8. This does not mean that all local knowledge is necessarily wholly generated within a particular national or subnational context: the role of external experts is often crucial in enhancing the knowledge base of local researchers.
9. Here, by Northern research, we mean research projects that are led by Northern-based researchers but which may also have Southern researchers in the team. And vice versa for the Southern-based data. We did not assess the citizenship of all researchers in our sample, or any other indicator of origin such as place of birth. The data are based on the location of the grant recipient, and where grant monies were managed from and expended.

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**Chapter 8 –**

# *A better measure of research from the Global South*

**Summary**

This publication raises a call to action for research funders and research evaluators globally. To do so, it presents an overview of the RQ+ approach, the rationale for its development, and what has been learned from its application at IDRC (see chapter 8 of this dissertation). To inspire action, the chapter presents an argument for further trialing and improving of the RQ+ approach with science systems actors of all types, including: funders, research organizations, universities, and journals. As an invited commentary in a leading multi-disciplinary journal, this publication highlights the originality and importance of the work.

**Role of the PhD candidate:** As co-first author of the paper with the President of IDRC, I conceptualized and led the underpinning framework development and the validation study described herein (see chapter 8 for details). I conceptualized and wrote the first draft of this manuscript, elicited and managed inputs from my co-author, and together we drafted the final version. Together we guided the paper through editorial reviews – including my sole appearance at an in-person presentation of methods & results of the *RQ+* stream of this dissertation to an editorial committee meeting at *Nature* headquarters in London, England. Co-first authorship of the paper allowed the combination of subject-specific expertise (myself) with knowledge of the global research landscape (JL) in which we present the call to action.

**Reference:** Lebel J, McLean R. A better measure of research from the Global South. *Nature.* 2018;559:23-26. doi:10.1038/d41586-018-05581-4.

# COMMENT



ILLUSTRATION BY DAVID PARKINS


# A better measure of research from the global south

Funders **Jean Lebel** and **Robert McLean** describe a new tool for judging the value and validity of science that attempts to improve lives.

In India, the world's leading producer of mangoes, up to 40% of the harvested fruit is destroyed in transit before delivery. This costs up to US$1 billion in lost income each year, affecting the lives and livelihoods of millions of farmers, traders and consumers. So researchers from India, Sri Lanka and Canada developed a suite of nanomaterials that can be sprayed onto fruit on the tree, in packaging or in transit, to extend its life. They trapped hydrophobic hexanal molecules (derived from plant waste) in a hydrophilic membrane so that they could be suspended in liquid for application to the fragile fruit.

In Egypt, more than 95% of women have experienced sexual harassment at least once, and most cases go unreported. So, in 2010, researchers at the Youth and Development Consultancy Institute in Cairo developed Harrassmap (https://harassmap.org/en). This online interactive resource enables people to report and map cases of sexual harassment. When it emerged that university campuses were hotspots, Cairo University implemented a policy to combat sexual harassment, the first of its kind in the Middle East. Other universities in Egypt are following suit.

Both projects help to solve pressing societal challenges. The researchers involved ▶

appreciate that the people who benefit from the projects are the ones who are best placed to judge the value and validity of the work. The research teams spent time developing their hypotheses and results with those who feel the effects. In each case, the research is robust and life-changing — exactly the combination that most people would say is the very purpose of science.

But both projects would score poorly if judged using only conventional approaches to evaluating research quality that prioritize the opinion of peers, the volume of papers published, and citations. That's a problem because it is endorsement from other scientists, not stakeholders, that drives career advancement for researchers in Egypt, Sri Lanka and India, as everywhere else.

Is the weakness in the science or in the way it is measured? Too often it is the latter, in our view. Dominant techniques of research evaluation take a narrow view of what constitutes quality, thus undervaluing unique solutions to unique problems. At Canada's International Development Research Centre (IDRC) in Ottawa, we fund just this sort of research: natural and social science that unearths fixes for the development challenges facing countries in the global south. The majority of the work we support is led by researchers from these countries.

So we at the IDRC developed a tool to evaluate the quality of research that is grounded in, and applicable to, the local experience. We used it to assess 170 studies and then did a meta-analysis of our evaluations. The results suggest that it is possible — and essential — to change how we assess applied and translational research.

## TUNNEL VISION

The limitations of dominant research-evaluation approaches are well known[1–5]. Peer review is by definition an opinion. Ways of measuring citations — both scholarly and social — tell us about the popularity of published research. They don't speak directly to its rigour, originality or usefulness. Such metrics tell us little or nothing about how to improve science and its stewardship. This is a challenge for researchers the world over.

The challenge is compounded for researchers in countries in the global south. For instance, the pressure to publish in high-impact journals is a steeper barrier because those journals are predominantly in English and biased towards publishing data from the United States and Western Europe[6]. With the exception of an emerging body of Chinese journals, local-language publications are broadly deemed lower tier — even those published in European-origin languages such as Spanish, Portuguese or French.

The metrics problem is further amplified for researchers who work on local challenges. Climate adaptation research is a case in point. Countries in the global south are on the front lines of global warming, where context-appropriate adaptation strategies are crucial. These depend on highly localized data on complex factors such as weather patterns, biodiversity, community perspectives and political appetite. These data can be collected, curated, analysed and published by local researchers. In some cases, it is crucial that the work is done by them. They speak the necessary languages, understand customs and culture, are respected and trusted in communities and can thus access the traditional knowledge required to interpret historical change. This work helps to craft adaptations that make a real difference to people's lives. But it is also fundamental to high-level meta-research and analysis that is conducted later, far from the affected areas[7].

Does the current evaluation approach scrutinize and give equal recognition to the local researcher who focuses on specifics and the researcher who generalizes from afar? Does the current approach acknowledge that incentives are different for local and foreign researchers, and that those incentives affect research decisions? Are we adequately measuring and rewarding research that is locally grounded and globally relevant? In our view, the answer to all of these questions is no.

## FROM NO TO YES

With the support and leadership of partners across the global south, the IDRC decided to try something different. The result is a practical tool that we call Research Quality Plus (RQ+)[8].

The tool recognizes that scientific merit is necessary, but not sufficient. It acknowledges the crucial role of stakeholders and users in determining whether research is salient and legitimate. It focuses attention on how well scientists position their research for use, given the mounting understanding that uptake and influence begins during the research process, not only afterwards.

*"Conventional evaluations were never this challenging, but neither were they so motivating."*

We think that the approach has merit beyond the development context. We hope that it can be tailored, tested and improved in a variety of disciplines and contexts, to suit the needs of other evaluators — funders such as ourselves, but also governments, think tanks, journals and universities, among others.

RQ+ has three tenets:

**Identify contextual factors.** There is much to learn from the environment in which research occurs. Instead of aiming to isolate research from how, where and why it was done, and by whom, evaluators should examine these contexts to reach a claim about quality. For the IDRC, this included five issues: political, data, research environments, the maturity of the scientific field and the degree to which a project includes a focus on capacity strengthening. For another funder, journal or think tank, these might — or should — be different.

**Articulate dimensions of quality.** The underlying values and objectives of the research effort need to be made explicit. Evaluators weigh these dimensions of quality using a formula that fits the context and goals of the research. The dimensions that matter to the IDRC are: scientific integrity (a measure of methodological rigour), legitimacy (a measure of the fidelity of the research to context and objectives), importance (a measure of relevance and originality) and positioning for use (the extent to which research is timely, actionable and well communicated). (See Figure S1 in Supplementary Information.)

**Use rubrics and evidence.** Assessments must be systematic, comparable and based on qualitative and quantitative empirical evidence, not just on the opinion of the evaluator — no matter how expert they are. For the IDRC, this meant evaluators speaking to intended users, to others working in similar areas and to non-scientific beneficiary communities, as well as assessing research outputs and associated metrics.

## ROAD TEST

The IDRC first used RQ+ in 2015. Independent specialists assessed 170 studies from 7 areas of research the centre had funded in the previous 5 years. For each area, three specialists rated projects using the three tenets described, looking at empirical data for each study: bibliometrics, interviews with stakeholders and IDRC reports on the work. The reviewers decided independently what data to collect and compare for each project, and held panel discussions to reach a consensus on the final ratings for each project.

This framework (see Figure S2 in Supplementary Information) encouraged a grounded, critical reflection on each project. And it helped systematic judgement to be applied across diverse contexts, disciplines and approaches to research. In exit interviews and follow-up discussions, the independent reviewers described the assessments as unlike any others they had done. They felt confident that the evaluation had been systematic, comprehensive and fair.

We learnt a lot from this process about the projects that the IDRC supports and how we could do better. For instance, we found that we need to prioritize gender across everything we fund, from climate modelling to the accessibility of justice, and not just in research projects that are

CLIFF CHENEY/ZUMA WIRE

**Women protest against sexual harassment in Cairo in 2013.**

aimed specifically at women and girls. As enshrined in one of the United Nations Sustainable Development Goals (SDG5), gender equality is key for unlocking development potential, so it was a dimension examined by the reviewers.

They found, for example, that a programme using national data sets to examine the implications of taxation and food labelling should have disaggregated the data by gender to achieve more with the same investment. Reviewers also highlighted exemplars, such as the African Doctoral Dissertation Research Fellowship programme, which helps PhD students to complete theses at their home institutions, enabling greater uptake by female applicants who shoulder more family duties. The programme considers gender balance when selecting applicants, and in reviewing proposed research.

As a result, the IDRC has rolled out, among other things, a new data system to mine gender data and workshops for staff to share and see good work.

In our experience, conventional evaluations were never this challenging, but neither were they so motivating and useful.

## THREE MYTHS BUSTED

To draw more-general lessons, the IDRC worked with an independent specialist to conduct a statistical meta-analysis using blinded data (see ref. 9 for a review). We aggregated results from our 7 independent evaluations of 170 components from 130 discretely funded research projects in natural and social science, undertaken in Africa, Asia, Latin America, the Caribbean and the Middle East[10]. This revealed three things.

**Southern-only research is high quality.** Research housed wholly in the global south proved scientifically robust, legitimate, important and well-positioned for use. Researchers in the region scored well across each of these criteria (higher, on average, than the northern and north–south-partnered research in our sample). In other words, those most closely linked to a particular problem seem to be well placed to develop a solution. (See Figure S3 in Supplementary Information.)

This finding challenges assumptions that researchers in the north automatically strengthen the capacity of partners in the south[11]. There are many positive reasons to support north–south research partnerships, but the data suggest that we must be strategic to optimize their impact.

**Capacity strengthening and excellence go hand in hand.** Too many funders assume that research efforts in which teams receive training and skills development inevitably produce poor-quality research. The meta-analysis found no such trade-off. In fact, we found a significant positive correlation between scientific rigour and capacity strengthening.

This suggests that research requiring a focus on capacity strengthening need not be avoided out of a desire for excellence. Indeed, it implies that the two can go hand in hand.

**Research can be both rigorous and useful.** In the fast-paced world of policy and practice, findings need to get to the right people at the right time, and in ways that they can use (see 'Co-producing climate adaptations in Peru'). We often hear of tension between sample saturation or trial recruitment and the decision-making cycle of policymakers or industry implementers. Happily, the meta-analysis found a strong positive correlation between how rigorous research is and how well it is positioned for use.

This finding builds the case for investing in scientific integrity, in even the most applied and translational programmes.

## FOUR CONCERNS

We have four main concerns about RQ+ and how it can be refined and adapted for broader application.

First, bias is baked into our study. We used our own tool to examine research we had already supported. RQ+ focused our post-hoc evaluations on the values that ▶

JIM RICHARDSON/NATIONAL GEOGRAPHIC CREATIVE

**Farmers in Pampallacta, Peru, inspect harvested potatoes.**

## CASE STUDY

### *Co-producing climate adaptations in Peru*

More than 500,000 people live in the Mantaro Valley in central Peru, where agriculture is the main source of income. The valley's small-scale farmers provide most of the vegetables and grains consumed in the capital, Lima, but are struggling to respond to the increasing frequency and intensity of extreme droughts, heavy rainfalls and frosts.

Using new and creative combinations of physical measurements and participatory engagement methods such as community mapping, the Geophysical Institute of Peru in Lima is providing a clearer picture of how the climate has changed in the region. This research is informing local policy and guiding adaptation actions. The project mapped hotspots across the region that were susceptible to climate change, and convened discussions with farmers and fishers about how they could adapt schedules and techniques to minimize its impact.

The team did not rush to publish the research in top-tier Western journals, partly because of the English-language barrier but largely because of the urgency of the problem. The research outputs needed to be immediately understandable and usable, so the team rapidly published its findings in working papers and reports (many of which were collected in a Spanish-language book[13,14]). These were immediately accessible to those in local government who needed the evidence to steer the response. As such, predominant metrics do not capture the value of this work.

The RQ+ review shone a different light on this project and its achievements. It scored highly for integrity (including innovative blending of techniques for knowing the climate), for being legitimately grounded in local needs and knowledge, for addressing an urgent problem, and for focusing on uptake and action. J.L. & R.M.

matter to our organization. The method examines our objectives and priorities, as we define them. Some would counter that it reifies them.

Second, this tool, much like all others, could have a distorting effect. For instance, by asking reviewers to examine integrity and legitimacy — issues that we identify as fundamental to our success — we turned their attention away from other factors, such as productivity (volume of publications and outputs) and cost-efficiency.

Third, there is the risk that RQ+ results become isolated if they are not comparable with the prevailing measures of research quality used by the global research enterprise. Is RQ+ just another demanding hurdle for researchers in the global south? That's a question we are still working to answer.

Fourth, RQ+ costs more and takes longer than asking two or three peers to offer their opinions. Our hunch is that it takes almost twice as much time and money, largely because it requires empirical data collection by the evaluators. For us, that is time and money well spent: the results help us to hone our approach to funding and engagement.

These concerns will guide our efforts to improve RQ+, as will input from our peers and partners.

## MORE LIKE THIS

What next? If the trillions of dollars being invested in research globally each year[12] are to make a difference, we must do better than crude quantification of citations, as the Leiden Manifesto[1] and the San Francisco Declaration on Research Assessment[2] have made clear.

We believe RQ+ presents a practical solution. The approach and findings of our meta-analysis now need replication in other contexts. At IDRC, we are planning another retrospective assessment in 2020. We are excited by what progress and shifts it might uncover. We are already looking at ways we can use RQ+ for grant selection, monitoring the progress of individual projects, and communicating our organizational objectives to funding partners and applicants.

Similarly, we encourage other funders and institutions to improve their evaluations in three ways: consider research in context; accept a multidimensional view of quality; and be systematic and empirical about evidence collection and appraisal. It's time science turned its greatest strengths on itself — experiment, appraise, debate and then improve. ■

**Jean Lebel** *is president and* **Robert McLean** *is senior programme specialist at the International Development Research Centre, Ottawa, Canada.*
*e-mails: jlebel@idrc.ca; rmclean@idrc.ca*

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**Supplementary information accompanies this article: see go.nature.com/2ja2dfr.**

# Supplementary information to: A better measure of research from the global south

*To accompany a Comment published in* Nature ***559***, *23–26 (2018)*
*https://www.nature.com/articles/d41586-018-05581-4*

*by Jean Lebel and Robert McLean*

**Supplementary information to accompany a Comment published in *Nature* 559, 23–26 (2018)**

**https://www.nature.com/articles/d41586-018-05581-4**

# A better measure of research from the global south

**by Jean Lebel and Robert McLean**

**Figure S1. Research quality is multidimensional.**

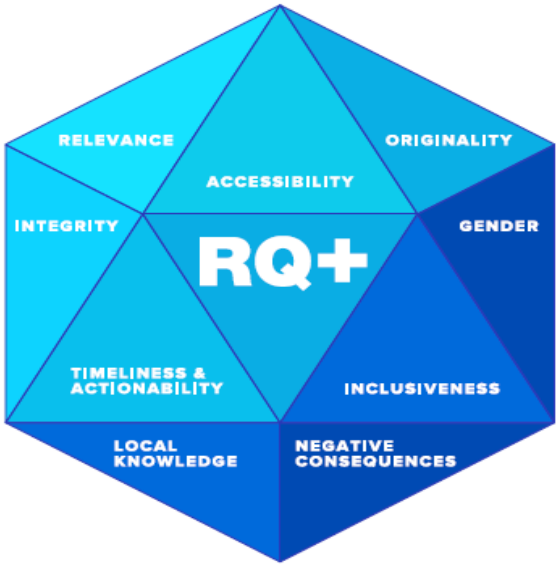


**Figure S2. RQ+ as applied at the International Development Research Centre (IDRC).**

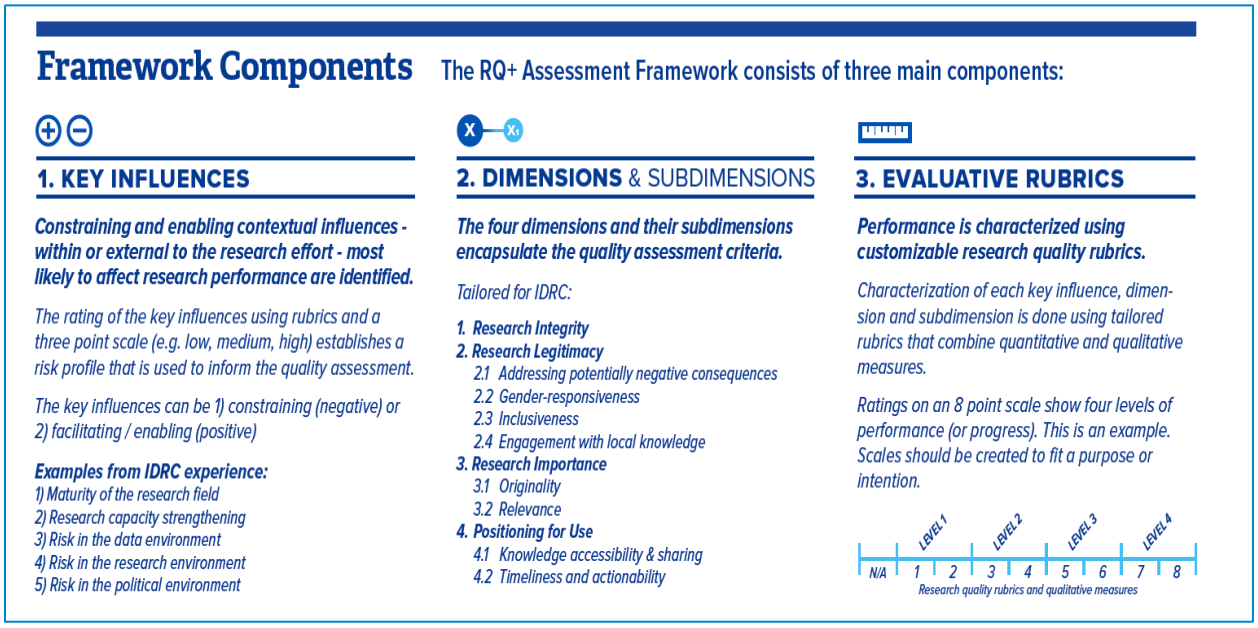
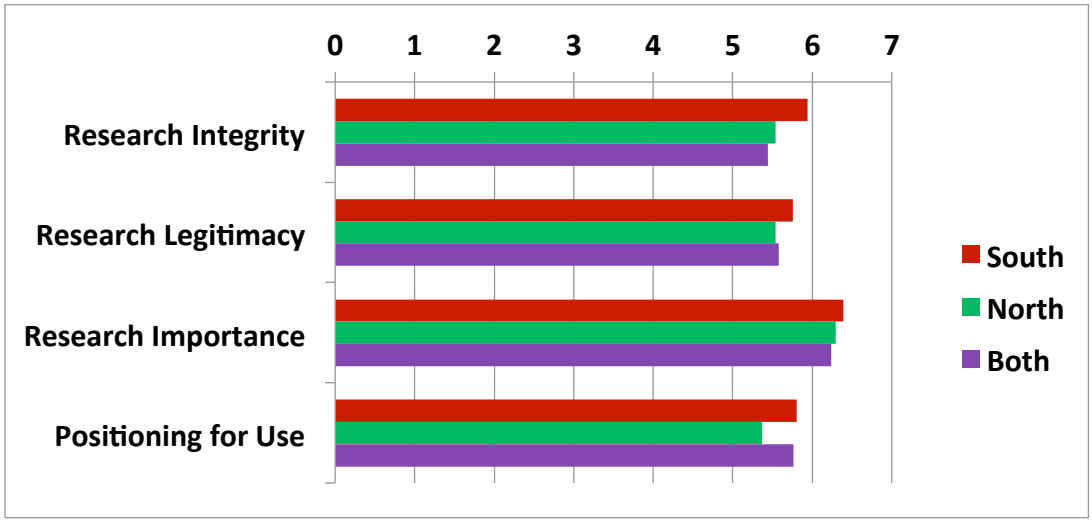



**Figure S3. Research quality by dimension and by location.**

Numbers 1–7 are the graduated scores of RQ+ rubrics. 1,2 = Unacceptable; 3,4 = Less than acceptable; 5,6 = Good; 7,8 = Very good. (Each rubric has a qualitative description, per dimension, to support reviewer consistency in the rating process.)




Source: McLean, R. & Sen, K. *Making a Difference in the Real World? A Meta-Analysis of Research for Development* (IDRC, 2018).

# PART IV

## DISCUSSION

## AND

## CONCLUSION

**Chapter 9 –**

# *Integrated discussion*

**Summary**

In this chapter I discuss the implications of the complete dissertation for research, practice, and policy. The chapter begins by revisiting the rationale and objectives of the overall project. Next, I summarize the objectives and results of each preceding chapter, and therefore, each of the *Funders' KT, Scaling Science,* and *RQ+* research streams. After this, I present a discussion that draws together results from each publication and illuminates their higher-level implications for knowledge and action. To conclude, I shed light on limitations and strengths of this overall PhD dissertation.

## 1. Research purpose and results

Research into knowledge translation and scaling has predominantly examined the role of researchers and how they share knowledge with intended research users. Without question, this remains an important area of scholarship. Accordingly, the field of 'KT science' or 'implementation science' is growing. Journals such as *Implementation Science*, *Evidence & Policy*, or *Health Research Policy and Systems* provide a platform for sharing health sciences work on KT. At the same time, research funders around the world are asking more of the researchers they fund in terms of translation and social impact (Mclean et al. 2018). KT and 'KT science' is in bloom.

The research presented in this dissertation, however, has aimed to make a novel contribution by shining light on a lesser understood area of KT: the role of research funders. To do so, the dissertation has been partitioned into three interconnected research streams: *Funders' KT, Scaling Science, and RQ+.* Each stream has explored distinct questions (see chapter 1) to unpack this challenge from different viewpoints and experiences. For reference, the objective of each research stream is:

1. ***Funders' KT*** **-** To advance understanding of how research funders support KT
2. ***Scaling Science*** **–** To identify strategies to optimize funders' research for KT and impact
3. ***Research Quality Plus*** **-** To develop a KT-inclusive strategy for funders' research evaluation

The rationale for casting the lens on research funders is justified for 1) academic, 2) utility, and 3) moral reasons. First, there is a gap in knowledge surrounding the funders' role in KT. The nominal work on the topic showcases how funders have been considered a 'contextual factor' rather than an influencing actor. An aim of the dissertation was to bring the funders' role into the academic conversation. Second, in terms of research utility, there is clear and immediate demand for practical evidence, from funders globally, who are wanting to do better to support KT and more meaningful research impact. Third, the interconnected nature of a growing understanding of 'research waste' and a global health crisis weaves an ethical

dimension into the case for studying KT effectiveness and efficiency. Throughout this dissertation, I have argued that funders exert power over the research ecosystem as a financier and gate-keeper, and as such, can play a significant role in improving KT processes and outcomes. When funders aiming for 'big impacts' are funded by public taxation – or, in the case of foundations and philanthropies, when they intervene in public lives without public oversight – the case for improved governance of KT becomes a moral prerogative.

To illustrate how the dissertation has provided a unified contribution, the remainder of this chapter presents three sub-sections. The construction of the chapter has benefited from the guidance of Lewis and colleagues (2020, in review) and their advice for writing an "integrated discussion" for an article-based thesis or dissertation. In keeping with this approach, the first sub-section provides a summary of the aims, design, and results of each chapter as a refresher. The second sub-section, articulates an integrated discussion. This component draws the results of each chapter together, to articulate higher level inferences by examining the dissertation research as a whole, rather than the individual publications or research streams. To conclude, the third sub-section outlines overarching strengths and limitations of the dissertation. Again, these reflections relate to the overall body of work, not the limitations or strengths of the individual chapters.

## 2. What has each component of the dissertation contributed to knowledge and practice?

*Funders' KT*

In chapter 3 (McLean et al. 2012), I set out the parameters for the first comprehensive and focused evaluation of KT at a research funding agency – the Canadian Institutes of Health Research. The study results included a detailed account of the CIHR KT programming, a novel theory of change for the role of CIHR in supporting KT, and a comprehensive and transparent protocol for conducting the evaluation. As the first comprehensive study proposed to examine the role of a research funder in KT, the open access study protocol sheds new and much-needed light on how funder-based KT evaluation might be modeled and implemented by others. In addition, the articulation of the KT activities, investments and 'theory of change' of KT at CIHR contributes a transparent overview to the practice record.

In chapter 4 (McLean et al. 2018), I aimed to take stock of the state-of-the-art in global funder KT practice. To do so, an international scan of 26 public funding agencies was conducted. This study collected primary and secondary data on KT activities from each funder using in-depth qualitative interviews with organizational leaders and web-based surveys. The work reveals that KT is an area of increasing importance for funders internationally. It outlined how these funders resource KT activities (human and financial), program KT (grant or award type, etc.) and build KT into their organizational strategies. Yet, how funders support KT varies markedly, and limited evidence is available for the effectiveness or efficacy of funder KT efforts.

*Scaling Science*

Stream two of the dissertation moves beyond the question of research translation into practice and policy, and interrogates how the magnitude, variety, equity, and sustainability of research impact is optimized. This area of study – scaling science – aims to guide funders and researchers to think more deeply about the full spectrum of possible implications of their work.

Chapter 5 introduces the *Scaling Science* research stream, research that was undertaken in collaboration with the International Development Research Centre. The study responds to IDRC's desire to better understand how they can build meaningful impact from the science they fund. To do so, I led a team of engaged research-users from IDRC, through an IKT research process of project review and field validation of emerging findings. Specifically, the study involved an environmental scan, retrospective review of projects funded at IDRC during the period 2010-2015 (n=200), in-depth case studies (n=5), and sense-making workshops with the IKT engaged research-users, but also, study participants and external experts. The work resulted in new and practical thematic categories for scaling impact. The first category is four guiding principles for scaling impact, namely: Justification, Optimal Scale, Coordination, and Dynamic Evaluation. These principles present an evidence-based framework for managing scaling in science and research. The typology of pathways to scale provides a conceptual model that funders can use to manage, monitor and evaluate the scaling (and therefore KT) efforts they support. *Scaling Science* results are currently being used by IDRC to supplement KT practice and support their researchers in generating research impact.

Chapter six (IDRC 2020a) outlines a tool for researchers interested in building scaling thinking into their work from the outset. Based on the findings of the *Scaling Science* research stream, the *Scaling Playbook* presents an evidence-based, action-oriented tool. To ground the Playbook in experience, it was tested and revised with leading health researchers (n≈30) in two discrete validation workshops – once in Dar es Salam and once in Kigali. Currently the Playbook is circulated by IDRC to new grantees with the aim of improving how IDRC – the funder – lends support to research translation in its grantee community.

*Research Quality Plus*

Chapter seven (McLean & Sen 2019) introduces the *RQ+* research stream. The aim of research work was to develop, pilot, and validate an alternative method of research quality evaluation that includes KT. The research stream included framework development, application and testing in seven multi-component independent evaluations, and meta-analysis of the aggregate data. The findings of the meta-analysis have been strategically beneficial to the intended-user, IDRC. They include areas requiring improvement (for example, the gender responsiveness of IDRC-funded research) as well as strengths to showcase and build upon (for example, the higher relative quality of Southern-led research when addressing Southern challenges). In fact, findings of the RQ+ meta-analysis challenge long-held conventional wisdom in global research systems, including: 1) that Southern research is poorer quality, 2) that North-South partnered research will build the capacity of Southern partners, and, 3) that there is an inherent trade-off between doing rigorous research and KT. These novel and truly disruptive results will hold significant weight in global research dialogue and debate. At the same time, the successful implementation of this research stream indicates how alternative methods of research evaluation are feasible for funders, and provides a

methodological innovation for tailored reproduction. In other words, it demonstrates that funder-led, KT-friendly research evaluation is both possible and essential.

Chapter 8 (Lebel & McLean 2018) furthers the *RQ+* research stream by synthesizing the results into an academic commentary/perspective publication aimed at a global audience of potential users. Similar to chapter 6, the aim was knowledge translation. That is to say, I aimed to move the results of the *RQ+* stream into action. To do so, I presented an in-person defense of the RQ+ approach and evaluation results (see chapter 7) to the editorial team of the journal concurrent to drafting the manuscript. This publication has driven interest in the research stream amongst research funders and research systems actors globally.

## 3. Integrated discussion

This sub-section draws the independent publications of the dissertation together. The aim is a higher-level exploration of the coherence, novelty, and importance of the knowledge generated in the complete body of work. I argue that three contributions come to light, and these are: 1) new knowledge and theory of the funder's role in KT, 2) new practical approaches for funders to evaluate KT, and, 3) new practice and policy tools for funders to design, manage, and support KT.

### 3.1. New knowledge and theory of the funder's role in KT.

The dissertation presents new knowledge and theory of the funder's role in KT. In composite, the knowledge produced, and compiled herein, helps to identify areas needing further research and provides novel concepts and frameworks for guiding this work. In this sub-section, I outline how individual components of the dissertation fit together to form higher-order implications for research.

Chapter 3 has described how CIHR supports KT in significant detail[7]. This organizational overview provides a comprehensive 'look under-the-hood' that other funders – and researchers interested in KT – may benefit from studying, critiquing, or replicating in their KT programming efforts. Given CIHR's colloquially-cited position as a global thought leader in KT, this work provides a particularly valuable overview. In addition, chapter 3 provides a novel 'theory of change' for KT efforts at CIHR. John Mayne (2015) describes a theory of change as a map illuminating the pathway of logical connections, and assumptions, for an organization's activities to produce intended impacts. Accordingly, the novel theory of change for CIHR KT provides the benefit of making explicit the assumptions and program logic that a funder might consider or require when placing focus on KT. This contribution is unique and important to the field of study. It pushes the boundaries of knowledge beyond what activities or programs the funder is undertaking towards an articulation of their strategic intent. In simpler terms, it uncovers more than *what* CIHR does to support KT, it illustrates *why* and *how* they assume this will work. I suggest its IKT construction – that is to say, its co-production between multiple stakeholders – lends additional validity and importance. In previous bodies of research on research impact, including several prominent reviews, the funder is not examined as a central actor (Contandriopoulos et al. 2010; Penfield et al. 2013; Milat et al. 2015; Greenhalgh et al. 2016). In previous work that does investigate the role of the funder in KT, the

[7] The results of the CIHR KT evaluation are published in open access as McLean & Tucker 2013.

examination does not include a 'theory of change' but instead focuses on activities (Cordero et al. 2008; Tetroe et al. 2008; Smits & Denis 2014). In short, research on the role of funders in KT is minimal. The overview of leading practice and the corresponding theory of change produced in this chapter help to fill this gap in the literature and knowledge. It also influenced the work presented in chapter 4 of this dissertation.

Chapter 4 provides an international stock-taking of the role of funders supporting KT. This state-of-the-art review is the first international scoping exercise of this scale and type since 2008 (Tetroe et al. 2008; Cordero et al. 2008). Although it is not as detailed or rich as the CIHR context described in chapter 3, the scan plays the role of globalizing the descriptive knowledge of *what* funders are doing to support KT. This cross-funder perspective resulted in several new and important findings. For example, it illuminates how funders finance KT efforts, staff KT activities, and perhaps most importantly, promote and fund KT within their research communities. The aggregate data provides a unique understanding of global trends in these domains. However, the development and application of the Intended-Realized-Emergent (IRE) framework as an analytical technique carries forward the theory of change-based analysis first generated in chapter 3. Indeed, the IRE framework facilitated an international look beyond activities to a detailed examination of funder intent, program logic, and underpinning assumptions for KT. In this chapter, we called these issues 'strategy'. This perspective led to an important finding. Although funders around the world are implementing elaborate plans and programs to support KT, there is a significant shortage of evidence guiding this work. This finding significantly influenced the body of work presented in this dissertation. It also sparked a call to action for funders globally to respond to this challenge (see for example Holmes 2018). This result would not have been as striking and meaningful without the conceptualization of 'funder KT strategy' as inclusive of evaluation. In essence, the IRE framework illuminates the considerable divergence between funder plans and the evidence underpinning them. Accordingly, the use of theory of change modelling, or the IRE framework specifically, is an area of future promise for research.

How this dissertation shifted attention to funder evaluation practice is addressed in the following sub-section of the integrated discussion. Before that, I turn to the knowledge contributions that have resulted from pursuing the evidence gap surrounding funder support for KT in the *Scaling Science* research stream.

Chapter 5 introduces a new and supplementary model for producing research impact: 'scaling science'. This line of inquiry corresponded to the finding of the international funders scan (chapter 4) which identified the need for evidence-based guidance for funders wanting to support KT. In simpler terms, funders were looking for support, and were open to receiving it. The *Scaling Science* research stream was conducted with one of these funders, IDRC, in the role of engaged research-user. The results will be useful for enriching academic exploration of the funder's role in KT, and better understanding how research impact happens at large. For example, chapter 5 presented a typology of pathways to scale and corresponding navigation strategies commonly observed in the projects under review at IDRC. This result complements existing models of research impact in the literature by placing focus on the means or pathway by which research results in desirable change, rather than the metric or indicator of the desired outcome. Outcome measures and metrics currently dominate impact measurement approaches (see Grant et al. 2010 for a comprehensive review; see CAHS 2009 for a widely accepted framework; or Researchfish 2020 for a leading for-profit measurement tool). I have argued that the typology of pathways to scale add useful knowledge categories for further research, but also for practical applications such as funder planning, management, or stratified evaluation. IDRC has put these categories to work in its sampling approach to a newly launched organizational evaluation (IDRC 2020b). In this way, they are

immediately influencing research. The aim is that they will help to develop more compelling and diverse, quantitative and qualitative, narratives of research impact.

As an additional contribution, chapter 5 is underpinned by illustrative case studies that deductively express examples of scaling impact for the public good. This is a needed area of innovation and research, and the scaling impact case studies provide a useful model. For example, with the introduction of the impact component of the UK's Research Excellence Framework (REF), the documentation and collection of research impact narratives is now required of universities across the UK (Greenhalgh & Fahy 2015). Although the REF is unique, the pressure from governments to track and demonstrate impact is not (Holmes 2016). The typology of pathways to scale developed in chapter 5 provides a new theory-driven means of documenting, categorizing and diversifying impact narratives – and potentially for analysing results.

At a higher level, the *Scaling Science* research stream has produced an overarching conceptual model with potential to enhance our understanding of the KT paradigm. In chapter 5 and 6, I have argued that 'scaling' can provide a conceptual supplement to 'KT'. Whereas KT has been concerned with the conversion of research into action, scaling focuses on how we optimize the magnitude, diversity, equity, and sustainability of the impacts of these actions. This makes a novel and important contribution to 'KT science'. I propose that it presents a new model or theory for examining research impact which I call *Scaling Science*. *Scaling Science* as a supplemental paradigm to discovery and applied science is illustrated in figure 1.

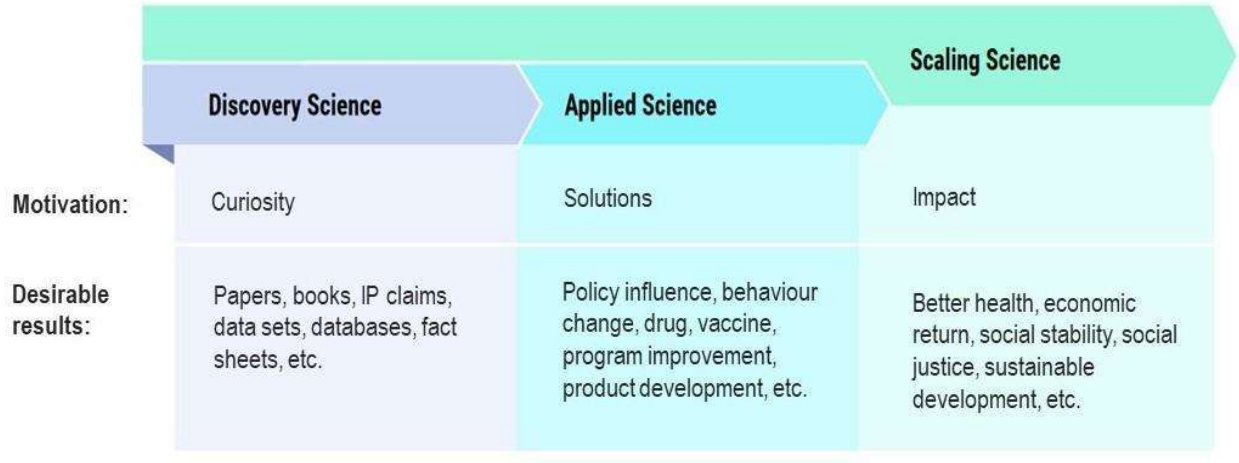



**FIGURE 1** Scaling Science as a supplement to discovery and applied science

From this perspective, scaling can be considered one of the ultimate phases of KT. Conceptually speaking, it moves our thinking about knowledge to action from 'implementation of a solution' to 'optimization of the impacts'. The pathways, principles, and case studies presented in chapter 5, and elaborated in the publication McLean & Gargani 2019, provide a starting place for researchers intrigued by this addition to the knowledge base. At the same time, a 'science of scaling' is an invitation to develop this field with

imagination, critical thinking, and systematic collaboration. Funders (IDRC 2020b) and researchers (Gogovor et al. 2020) have responded and are set to make fresh contributions.

In conclusion, this dissertation makes an important contribution to knowledge and theory. Over the course of the dissertation, these ideas have fueled and strengthened each other, and the cumulative results contribute to advanced knowledge of KT and the development of a science of scaling. The key knowledge implications include, 1) new descriptions of funder practice in KT through an in-depth case-study with CIHR, IDRC, and an 26 agency international review, 2) The articulation of a theory of change for funder KT activities, and the use of this approach in the IRE model for multi-funder KT strategy analysis, 3) the adoption of the pathways approach in a new typology of pathways to scale, and, 4) the articulation of scaling as a supplement to KT, that aims to focus research attention on impact optimization.

### 3.2. New and practical approaches for funders to evaluate KT

In the dissertation I have developed, implemented, and validated new methods for evaluating research with KT in mind. Three immediately practical innovations have been produced: 1) a reproducible evaluation protocol; 2) the RQ+ approach; and, 3) a guiding principle of dynamic evaluation. These innovations may be of value to research funders wanting to critically assess their KT efforts and contribute to filling a significant practice gap, which was itself first identified in chapter 4 of this dissertation. This demonstrates how the dissertation was adaptive to emergent knowledge needs. The dynamic evaluation principle and the RQ+ approach may be useful for funders, but also others, such as think tanks, universities, or journals.

A focus on building and sharing KT evaluation approaches was a priority from the outset of the dissertation. Chapter 3 contributes a comprehensive study protocol for an evaluation of KT support at a research funder. The development and publication of this protocol was an attempt to share methods for funder KT evaluation, in a similarly transparent and scientific way to a researcher planning an evaluation of a KT intervention within the health system. This is not a standard component of doing funder-based evaluation. Publishing the protocol took much negotiation, extra-curricular effort, and leadership. Its publication represents an important precedent in transparency and scientific rigour for CIHR and funder-led evaluation at large. Other funders, such as the Michael Smith Foundation for Health Research (MSFHR), have accepted the challenge and are embracing rigorous and provocative science as a part of their role as funder (MSFHR 2020). MSFHR's leadership in KT is an exposition of international importance. The potential downside to this type of funder work is the hurdle it may create for those without the political will or resources to undertake such an exercise. This concern must continue to be monitored. It does not undermine the overall potential of these efforts. Nevertheless, the study protocol (chapter 3) outlines a multi-component, mixed-method approach to an organization-wide review of KT support. A particularly valuable part of this work is the IKT method by which it was produced. By blending the experience of KT experts, funder-based KT staff, the research community it was intended to serve, and professional evaluators, the protocol includes multi-perspective nuance and sophistication. This IKT constructed evaluation protocol is unique in the field. Practically speaking, the evaluation it guided produced actionable recommendations for CIHR to fine-tune their KT program, and they can be reviewed in the open access report McLean & Tucker 2013. The results have not been included as a formal chapter of this dissertation but remain an important ancillary outcome. In the compilation of this dissertation, I elected to present strictly the study protocol as it represents an innovation, a reproducible model, and a

roadmap for research funders globally. It does not provide the political will and resource commitment required for self-critical funder evaluation, but it does open a viable scientific pathway.

As I progressed in the research, the focus on evaluation increased in importance. The international funders scan, provided in chapter 4, shows that research funders fall short on evaluative evidence to guide KT activities. Specifically, the scan uncovered that, at the time of study, only one research funder had published an evaluation of their support for KT. Yet, the majority of funders contacted indicated they were interested in doing more. Two general reasons were cited for the shortcoming: know-how and financing. At this juncture, I pivoted the research focus towards filling the know-how gap, by developing, trialing and sharing 'funder-friendly' KT evaluation approaches and tools.

To begin, chapter 5 of this dissertation has contributed a number of categories and concepts useful for guiding funder-led KT evaluation. Indeed, and as mentioned above, these are being put into use as stratification criteria and as a conceptual framework in a current IDRC evaluation (IDRC 2020b). At the same time, the empirical research presented in chapter 5 specifically introduced a novel stance for undertaking scaling evaluations: 'dynamic evaluation'. Dynamic evaluation aims to match the dynamism of research and its translation. As a guiding principle, it reminds the user that impact pathways are unpredictable, usually long, winding, and involving a multiplicity of actors. To help bring this principle to life, chapter 6 presents a researcher-validated tool. Funders may use it to support their researchers as they model a dynamic evaluation stance into their projects. IDRC will distribute this *Scaling Playbook* to all new grantees. Other funders interested in KT or scaling-focused evaluations might benefit from thinking about this work as dynamic, rather than simply audit and feedback.

The most direct implication for evaluation practice stems from the *Research Quality Plus* research stream. The RQ+ approach adds three tenets to a research evaluation. These are: 1) accept a multi-dimensional view of research quality, 2) evaluate research within its context, 3) base judgements on expertise and empirical evidence. As such, RQ+ offers perhaps the first practical response to prominent critiques of the conventional research evaluation methods (SFDORA 2020; Hicks et al 2015). In response to the findings of the work conducted in earlier phases of this dissertation, KT or 'positioning for use' holds a central position in the framework. Figure 2 provides a visual illustration of RQ+ and how the tenets intersect.


**FIGURE 2** Research Quality Plus *Source:* McLean & Feinstein 2016

The implementation of RQ+ at IDRC in seven independent evaluations, and the subsequent meta-analysis of the aggregate data, shed light on motivating and actionable findings for IDRC. These results are detailed in chapters 7 and 8. What is notable about the *RQ+* research stream is the validated method it presents. RQ+ is a direct contribution to the identified gap in know-how for funders; naturally, a requisite aim of this research stream was to increase focus on research uptake. For example, I invested effort in KT activities such as the development of an RQ+ website, fact sheet, findings brief, and a series of conference presentations (see for example: IDRC 2020c; IDRC 2019; Ofir et al. 2016; McLean et al. 2018). In these sharing events and reports, both the benefits and concerns of using RQ+ in funder practice have been tabled. Concerns relate to cost and time investment are not a small matter for funders with dwindling or flatlined budgets. A corresponding improvement in the next application of the method at IDRC is to better track specific costs. Sharing costing data alongside RQ+ evaluation results will improve how funders test and further advance the approach.

In summary, this dissertation sheds light on a critical and prevalent roadblock for funders aiming to support KT: the know-how to meaningfully evaluate these efforts. The research uncovered the breadth of this challenge in its international funders scan and has produced three practical responses. First, a reproducible study protocol for modelling a KT-focused evaluation at a research funder. Second, a novel concept of dynamic evaluation, which positions learning about KT in research programming as a

continuous and adaptive process. Third, the RQ+ approach for holistically evaluating research. Each of these contributions holds potential for guiding funder practice and policy related to evaluation. Moreover, a blended approach to the three innovations may offer funders potential beyond the scope of what was explored in this dissertation. For example, a plausible improvement on the RQ+ approach will be its application as a dynamic evaluation device in ongoing research management.

### 3.3. New practice and policy tools for funders to design and manage KT

Over the course of this dissertation I have generated actionable practice and policy implications for funders. These results stretch beyond the pressing demand for KT-inclusive evaluation into the domains of research program design and management. Hereafter, I elaborate on these contributions and implications.

Chapter 5 introduced the concept of guiding principles as a tool for research management. Although guiding principles are not a novel device for managers of innovation, they have yet to take serious hold in public research funding organizations (Boncheck 2016). In this dissertation, I argue that they present advantages which are uniquely suited to governing the dynamism and idiosyncrasies of research and research funding. In particular, guiding principles support creativity and structured risk-taking, and unlike more traditional forms of hierarchical control, they allow for innovation to be contextualized. The *Scaling Science* research stream of the dissertation has articulated four specific principles for scaling, namely: justification, optimal scale, coordination, and dynamic evaluation. These specific principles are derived from a novel empirical review, and as such, are an evidence-based approach worthy of consideration by funders and researchers wanting to be more systematic about scaling and KT. It is conceivable that a shift from strict hierarchical control to common principles will increase the likelihood that research funders will flourish in the complex and changing environments they hope to navigate.

To increase accessibility of the dissertation for funders, I have placed considerable focus on translating the results into approachable formats. In other words, the nature of the dissertation objectives and study design emphasized focusing on translating results into action. Chapter 6 is an example. It proposes a means of building the four guiding principles uncovered in the *Scaling Science* research stream – justification, optimal scale, coordination, dynamic evaluation – into a research project from start to finish. This action-oriented tool is open access and translated into 3 languages (English, French, Spanish). The *Scaling Playbook* will be distributed to all future IDRC grantees for consideration in the implementation of their projects, and IDRC is committed to developing a workshop to accompany the work. As it is put into practice it will be further critiqued, debated, and improved by researchers from a multitude of disciplines and traditions. As such, it will guide a fresh set of contributions to the science of scaling within IDRC's research community. The *Scaling Playbook* adds to and complements existing scaling tools (WHO 2010; WHO 2011; Jacobs et al. 2018) but is unique in its primary focus on guiding principles intended for researchers, rather than stepwise modelling aimed at implementers.

Chapter 8 is another example of the KT effort of this dissertation. It also highlights practice and policy implications of the *RQ+* research stream that are yet untested, but in my view, hold significant potential for funders and other science systems actors. To date, RQ+ has been used to conduct post-hoc evaluations of completed research projects. However, there is potential for the tool to be implemented as a research selection, design, or general management approach. For example, journals might use a tailored version

for manuscript reviews, to assure systematisation, increase fairness and improve comparability of peer-assessments. Universities and think tanks could tailor a version to evaluate staff work, ensuring it is aligned to institutional values and mission. Funders could use an RQ+ iteration to select which projects to fund. The approach is certainly not a panacea, but it has demonstrated its ability to make science governance more scientific in its early applications.

In short, components of this dissertation – namely the *Scaling Science* stream – hold immediate value for research funder practice and policy. Other components, like the *RQ+* stream, have demonstrated potential that, with careful consideration, might be transposed to new practices and policies across science systems actors.

## 4. Strengths and limitations of the dissertation

Below, I elaborate strengths and weaknesses of the overall dissertation. The strengths and limitations of each dissertation component are presented as appropriate in each publication (chapter of the dissertation).

### 4.1. Limitations

1. A first limitation of this dissertation relates to sampling and scope. The *Funders' KT* research stream placed focus on a sample of research funders based in the Global North (in both chapter 3 & 4). This sample frame may have left lessons unidentified and therefore unreported. This could affect dissertation reliability and generalizability. Results of this scan should be interpreted with this sampling parameter in mind, particularly when it comes to generalizability for regions of the Global South. Indeed, I do not perceive the scan has produced invalid the results. The research was methodologically sound, and the sample of 26 agencies is robust for the research objectives and questions. Rather, I caution that generalizations to Southern funders should be made with care. To mitigate, a third-generation funders' scan is currently planned, and it will be scoped to include a truly global perspective. This is a necessary and welcome addition to the body of knowledge on research funder experience in KT.

2. A second limitation of this dissertation relates to an unexpected data deficiency. Given the lack of evaluative evidence available on funder KT, the research was unable to fully address question 2.

   > **Research Question 2***: Which roles have been evaluated? If evaluations exist, what can be deduced about the efficacy of KT support activities?*

   The intent during the design stage of this dissertation was to synthesize collected KT-focused funder-led evaluations to draw out higher level evidence and lessons. The results of this meta-evaluation would be provided back to funders in later phases of this dissertation project. However, only one evaluation was identified during the international scan. I believe this is not a shortcoming of the data collection approach, as multiple methods were conducted (interviews, member-checked templates, website review) and sources were contacted (senior funder staff, KT staff, funder websites, google and pubmed searches) to elicit funder evaluations. The mitigation

strategy was to pivot the dissertation away from the meta-evaluation and the third-generation funders' scan, and instead, increase focus on developing the evaluation knowledge, tools, principles, and guidance that became research streams two and three. When the planned third-generation scan is launched, it will be of significant interest to follow-up specifically on evaluation progress with funders.

3. A third limitation of this dissertation relates to external validity of results of research streams two and three (*Scaling Science* and *RQ+*). These streams were executed as a single-funder case study. Although this allowed knowledge user engagement and meaningful knowledge co-creation (strong internal validity), it generated findings that are contextualized to this funder's experience (weakening external validity). The mitigation strategy has been three-part. First, I validated results in workshops with researchers from outside of IDRC on three continents. Second, I declare this limitation transparently when communicating results and their potential for use. Third, I encourage other funders to tailor, test and create in new contexts.

### 4.2. Strengths

1. The multi-stream research design facilitated focused exploration of a broad central theme. By partitioning the dissertation into research streams, I could combine the benefits of broad overview with the rich detail attainable through a case-study lens. The multi-stream approach also provided the benefit of emergent learning. That is to say, as findings were uncovered in one research stream, complementary areas of the dissertation were able to be positioned in response. A case in point is the shift of focus from a synthesis of global funder evaluations – when it was uncovered there were none – to the development and testing of evaluation methods.

2. A second strength of the dissertation is the consistent identification and involvement of a research-user partner. Each research stream was inspired by the tenets of the IKT approach and aimed to utilize the perspective and experience of research-users through the research process (Graham, Tetroe & Pearson 2014). The IKT approach steered the research towards knowledge and practice gaps and ensured that the results of each stream were grounded and immediately actionable.

3. Given the above, a further strength of the dissertation is the continued focus and effort placed on KT sharing activities (sometimes called: 'research communications', 'end-of-grant KT' or 'dissemination'). The sharing efforts are not all included in this dissertation for examination. They nevertheless play an integral role in the overall success of this project. They include seminars, conference presentations, private meetings, fact sheets, policy briefs, blogs, academic publications, videos, and social media engagement. Results of the *Scaling Science* and *RQ+* streams are compiled on dedicated websites: www.idrc.ca/scalingscience & www.idrc.ca/rqplus – although these are not complete records.

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**Chapter 10 –**

# *Conclusion and recommendations*

**Summary**

This chapter concludes the dissertation. To shed light on the future of work on the topic, it presents a series of recommendations for research funders, researchers, and other science system actors.

## 1. Conclusion

This dissertation contributes to filling knowledge, practice, and policy gaps concerning the research funder's role in KT. Specific contributions of each publication have been presented in turn throughout the preceding chapters. Unified implications of the dissertation have been articulated in the integrated discussion of chapter 9. In aggregate, the research has generated an original and coherent body of knowledge. As such, the dissertation provides a positive and useful response to the overarching research objective: *to advance knowledge of how research funders can support knowledge translation.*

To briefly recap, the funder's role in KT is a unique area of study. Only three reviews are available in the literature on the topic (Tetroe et al. 2008; Cordero et al. 2008; Smits & Denis 2014). This dissertation responds directly. It has built on the preceding research in its design and implementation, and as a result, has generated original and important results. Notably, it provides evidence for funders to better support, study, and therefore enhance their KT efforts. Through this dissertation I established a focus on research uptake, and accordingly, I have contributed results to the literature and practice record in open, accessible, and use-oriented formats.

As such, this dissertation offers a promising starting place. The promising results raise a call to action for further research on the funder's role in KT. Unfortunately, global circumstances make the case more poignantly.

As this dissertation is being completed, we endure an unprecedented global health crisis. The SARS-CoV-2 outbreak threatens all aspects of human life, and those with the least are threatened the most. In the private sector – where, for better or worse, incentives for innovation are economically efficient – the response has been immediate. Vaccines are being tested and trialed across the globe. Many hold promise. Many have even benefitted from public financial support in addition to private, as governments realize the importance of supporting these public health interventions. But, if a viable vaccine is developed, how will we ensure fair and equitable supply for all? While we wait, how can we prevent and treat? How can we sustain health systems under extraordinary pressures? How do we design public policies that account for SARS-CoV-2, the next pandemic, and the other dimensions of human health, happiness, and prosperity?

The answer to each of these questions is science and innovation. Specifically, science and innovation that is rigorous, relevant, legitimate – and just as importantly – positioned for use. Science and innovation that generates health and social impact.

This dissertation does not reach a single conclusive directive for funders' improving KT support and optimizing research impact. There is no silver bullet, no strategy that will *always* preserve and enhance the public good. To the contrary, a unified lesson of this dissertation is that funders must be wary of all-encompassing solutions. Context matters in research, and context matters just as much in research translation and scaling. However, this dissertation has produced promising ideas and converted these into practical and ready-to-use options. Now is the time for these ideas to be debated, tailored, tested, and improved.

To support funder action and co-development, notable results of this dissertation include:

- A rich description of KT at a funding agency considered a KT thought leader (CIHR);
- A testable funder's KT theory of change;
- A reproducible protocol for funder-based KT evaluation;
- An international state-of-the-art review of funder KT practice;
- Evidence-based pathways to impact at scale for research;
- Evidence-based guiding principles for scaling impact;
- A practical guidance document for putting scaling principles into research;
- The Research Quality Plus approach for holistic research evaluation.

I conclude that funders and researchers will benefit from testing and improving these innovations in their contexts. People and health systems will benefit if they do.

To guide future directions, a set of recommendations for research and practice is provided below.

## 2. Recommendations

*Recommendations for research*

+ A third global scan – that includes Southern-based research funders – is required. This work will diversify and strengthen global knowledge of the funders' role in KT. Findings of this dissertation demonstrate that Northern funders have much to learn.

+ *Scaling Science* presents a new paradigm for research that focuses on the public good. I argue that *Scaling Science* supplements implementation science and KT. Whereas KT focuses on converting research into action, scaling focuses on optimizing the impacts of these actions. Research that implements and tests this conceptual framework is required – whether to validate, contextualize, or refute it. In this light, several scaling science efforts have been initiated, including a funder-based evaluation of scaling efforts (IDRC 2020a) and a systematic review to develop reporting guidelines for health research scaling studies (Gogovor et al. 2020). These projects offer important contributions. Additional multi-disciplinary and systematic research is required to further advance the science of scaling.

+ The RQ+ approach shows considerable promise for improving research evaluations. However, it is not a ready-made panacea. Research that investigates contextually appropriate quality dimensions and

subdimensions will be essential for those who bring the approach into new settings. RQ+ must not be replicated, it must be adapted.

+ As IDRC conducts a second organization-wide RQ+ evaluation, it must document all benefits and costs (IDRC 2020b). Clear resourcing estimations will be required if IDRC hopes to spread awareness of the potential of the approach and understand the return on investment.

*Recommendations for practice*

+ As KT grows in prominence for funders around the world, it must be governed by evidence and evaluation. Funders should work with their research communities to commission and undertake robust assessments of their work. Frameworks developed in this dissertation offer a starting place.

+ Globally, research funders face increasing pressure to demonstrate societal impact. Funders should work together to share good practices and openly discuss failure, exchange new ideas, and even share aggregate data to support meta-evaluations. More will be accomplished together than alone.

+ The *Scaling Playbook* offers a unique, evidence-based tool for incorporating scaling science into research projects. An IDRC-supported user community of practice will open the door for dynamic evaluation of the *Playbook*'s efficacy and effectiveness. Learning alongside users will ensure it is adapted and improved. Subsequently, evaluating the impact of implementation will provide evidence to justify scaling the *Scaling Playbook.* Other funders who make use of this tool should likewise evaluate its success and value.

+ The Research Quality Plus approach provides a timely alternative to the status-quo in research evaluation. It re-imagines how funders – and others such as journals and universities – might select, encourage, and reward research. With appropriate tailoring (see above recommendation for research) funders can use RQ+ to improve the rigour and legitimacy of their evaluation efforts. Openly sharing evaluation results and process reports will promote debate and improvement.

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# APPENDICES

# APPENDIX 1

## *Candidate's revised PhD Research Proposal*

Approved May 2020

## Revisions to the PhD Research Proposal:

*Incentives and Innovation; An International Appraisal of the Role of the Research Funder in Knowledge Translation*

**Faculty of Medicine and Health Sciences**

**Stellenbosch University**

The following is intended as an official record of (minor) amendment to the PhD research program of Mr. Robert McLean. The revisions which are documented herein are respective of the following sections of the original PhD Research Proposal: "Research objectives and specific questions to be addressed", and "Annex 1 – schedule of proposed publications". Revisions are provided in blue text for ease of comparison.

**Prepared by: Robert K.D. McLean, M.Sc.**

Prepared with the approval of co-supervisors Prof Jimmy Volmink (Faculty of Medicine and Health Sciences, Stellenbosch University) and Dr Ian Graham (Faculty of Medicine, University of Ottawa).

Proposal originally approved: September 25th 2016

**This revision approved by FMHS: May 2020**

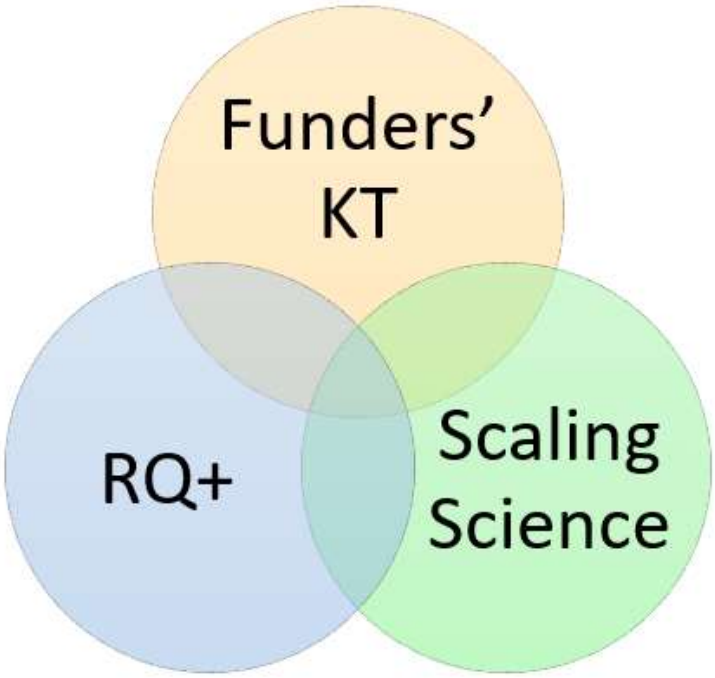
## Section 2) Research objectives and specific questions to be addressed

The over-arching objective of this research is to:

***Further knowledge of the role of public research funders in the process of knowledge translation. Where appropriate and possible, highlighting and critically assessing practical, auditable actions on the part of funders which have led to improved KT.***

To do so, the study will undertake empirical review via three interconnected research streams: 1) Funders' KT: the current activities and outcomes of an international sample of public health research funders; 2) Scaling Science: the pathways to impact and strategies to facilitate impact in a single funder case-study, and; 3) Research Quality Plus: the development and implementation of a new method for evaluating research quality keeping KT in mind. Further details on the research scoping, approach, and methods of data collection and analysis, are provided in the later sections of this proposal. Here, research questions designed to support the study objective are presented.

**Image 1: Innovation & Incentives: One research program comprised of three interconnected research streams**



**Specifically, this research will address the following research questions:**

**Stream 1 – Funders' KT**

Stream-specific objective: How do research funders support KT activities?

1 – What roles do research funders currently play in the KT processes of the research they support?

2 – Which roles have been evaluated? What, if evaluations exist, can be deduced about efficacy of KT support activities?

3 – Does the synthesis of primary data collected across funders, or funders programs/activities, provide new or higher quality knowledge about common or divergent practice? If possible, successful, or unsuccessful practice?

4 – Can any trends in funder support for KT be identified?

**Stream 2 – Scaling Science**

Stream-specific objective: What strategies might optimize funders' research for KT?

5 – What pathways have been followed to translate research into meaningful real-world impacts? Can any such 'pathways to impact' be identified, described, and/or categorized?

6 – What 'facilitating factors' have supported research while traveling these 'pathways to impact'? Can we identify, describe, categorize practical 'principles' for scaling impact?

**Stream 3 - Research Quality Plus**

Stream-objective: How might research funders evaluate research quality with KT in mind?

7 – Can a conceptual model of 'high quality research' - that accepts KT - be embedded in a research evaluation framework? If so, what can be learned by doing funder research quality evaluations with KT in mind?

By addressing these questions, the proposed research aims to generate new knowledge about the state of the art in research funder support of KT. It is plausible that the research will produce knowledge that is used in conceptual, instrumental, and symbolic ways. Not all research should produce and translate across the full spectrum of this framework (conceptual, instrumental, and symbolic), however, the practical and empirical nature of this study design would appear to support each type of utilization. For instance:

- Conceptual knowledge as per the significant gap in the understanding and discussion about the current activities and results of research funders in KT.
- Instrumental knowledge as per the practices which have proven effective, and under what conditions.
- Symbolic knowledge as per the use of evidence surrounding the roles of funding agencies to persuade decision-makers at funding agencies to uptake and learn from practical experience.

## Annex 1 – Schedule of proposed publications - Revised May 2020

| Publication | Objective | Research skills trained & demonstrated | My role | Status |
|---|---|---|---|---|
| **Research Stream 1 - Funders' KT** | | | | |
| *1.*<br><br>*"Understanding the performance and impact of public knowledge translation funding interventions: Protocol for an evaluation of Canadian Institutes of Health Research knowledge translation funding programs"* | **Research Questions:** 1,2<br><br>**Objectives:**<br>To advance knowledge regarding the role of a funding agency in supporting KT.<br><br>(The paper presents the background, methods, analytical approach of the over-arching evaluation of the role of a health research funding organization in supporting KT. It was approved as a publication to be 'carried into' the PhD.) | - Ethics approval received from Ottawa Hospital<br>- Literature Review<br>- Presentation of methodology and data collection protocols<br>- Discussion of study implications and eventual use<br>- Lead authorship of a peer-reviewed manuscript | I led the design of the paper, performed the literature review presented in the paper, led the design of the protocol presented in the paper, drafted the paper.<br><br>In addition I led the process of ethics approval from the Ottawa Hospital REB. | Published, as first author, in 2012 in: *Implementation Science* |
| 2.<br>*"Translating research into action: an international study of the role of research funders"* | **Research Questions**: 1,2,3,4<br><br>**Objectives:**<br>To compile an international stock of the types of work being undertaken by research funding agencies in KT and initiate a discussion of the | - Research ethics approved by Stellenbosch HREC.<br>- International scoping of funding agency role in KT<br>- Website & document reviews<br>- In-depth qualitative | I designed the study, conducted data collection and analysis, drafted the final manuscript. | Published, as first author, in 2018 in: *Health Research Policy and Systems.* |

| | | | | |
|---|---|---|---|---|
| | implications of the research for funding agencies and researchers. | interviews (n=26)<br>- Literature review<br>- Descriptive quantitative data analysis<br>- In-depth qualitative data analysis<br>- Discussion of implications and conclusions | | |

| **Publication** | **Objective** | **Research skills trained & demonstrated** | **My role** | **Status** |
|---|---|---|---|---|
| **Research Stream 2 – Scaling Science** | | | | |
| 3.<br><br>*"Scaling Impact: Innovation for the Public Good"* | **Research Questions:** 5,6<br><br>**Objective:** Undertake a deep analysis of the experience of the IDRC, and its funded researchers, converting research into impact. | - Ethics granted by Government of Canada's Treasury Board Secretariat *Policy on Results.*<br>- Study design and implementation<br>- Management of study reference group<br>- Data collection (lit review, qualitative interviews, study review n=200, case studies n=6 including international field work)<br>- Analysis and interpretation | I designed the study, chaired the research advisory group, led all stages of the research process, and led the authorship of the final reporting. | Published, as first author, in 2019 as a full-length, peer-reviewed book by: *Routledge, New York.*<br><br>(Chapters that address the PhD research questions will be comprised in the PhD dissertation.) |

| | | | | |
|---|---|---|---|---|
| | | - Reporting in written and oral formats | | |
| 4.<br>*"The Scaling Playbook: A Practical Guide for Researchers"* | **Research questions:** 5,6<br><br>**Objective:**<br>To translate the findings of the Scaling Science research stream into the practice of research | - Design and development of a KT tool stemming from my research. | I designed the format of the publication, wrote the first draft of the report, trialled the practical worksheets with researchers (intended users), and managed the process of final report production as senior author. | Published, as senior author, in 2020 as an open access report (practical guideline) in 3 languages: English, Spanish, French. |

| **Paper** | **Objective** | **Research skills trained & demonstrated** | **My role** | **Status** |
|---|---|---|---|---|
| **Research Stream 3 – Research Quality Plus** | | | | |
| 6.<br><br>"Making a difference in the real world? A meta-analysis of the quality of use-oriented research using the Research Quality Plus approach" | **Research Questions:** 7<br><br>**Objective:** To share the RQ+ approach framework, articulate the methods used to implement the approach, and share the findings of the first application. | - Ethics granted by Government of Canada's Treasury Board Secretariat *Policy on Results.*<br>- Developing a novel evaluation framework<br>- Designing a multi-component study<br>- Managing multiple study components | I designed the research protocol including: analysis framework, mutli-component implementation and aggregate meta-analysis, I conducted the data analysis and synthesis, I authored the final manuscript. | Published, as first author, in 2018 in: *Research Evaluation*. |

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| | | and research teams.<br>- Conducting a quantitative meta-analysis.<br>- Publishing a research paper. | | |
| 7.<br><br>*"A better measure of research from the Global South"* | **Research Questions**: 7<br><br>**Objective:**<br>To present findings of the meta-analysis conducted using the RQ+ approach to a broad scientific audience. | - Writing a broad-ranging research commentary based on results of our work.<br>- Presentation of results (data and data analysis techniques) to Nature editorial board in an in person seminar in London, England.<br>- I managed all editorial article production processes with the journal editorial team. | I conceptualized the publication outline, drafted the article, prepared all analysis and research underpinning the article, edited and submitted the final manuscript. | Published, as senior author, in 2018 in: *Nature.* |

# APPENDIX 2

## *Candidate's original PhD Research Proposal*

Approved September 2016

**PhD Research Proposal:** *Incentives and Innovation; An International Review of the Role of Health Research Funding Agencies in Supporting Knowledge Translation*

## Faculty of Medicine and Health Sciences, Stellenbosch University

**Prepared by: Robert K.D. McLean, M.Sc.**

Prepared under the co-supervision of Dr Jimmy Volmink (Faculty of Medicine and Health Sciences, Stellenbosch University) and Dr Ian Graham (Faculty of Medicine, University of Ottawa)

September 25th 2016

## 1) Introduction of topic and contextual significance

Health-related knowledge is converted into useful social applications in slow and inconsistent ways (AHRQ 2001; CIHR 2013; SA MRC 2015). The problem of knowing what to do with health research results – how to manipulate them, how to fit them into a context, how to apply them in the practical world and knowing when they are not appropriate for practical application – has proven deeply complex. This challenge is interdisciplinary, spanning all types of biomedical, clinical, population, and health systems research results. Moreover, the issue is global. According to the Director General of the World Health Organization: *"There is a gap between today's scientific advances and their application: between what we know and what is actually being done"* (WHO Director-General, 2005). In the United States, as one example illustrates, up to 55% of patients do not receive effective treatments where effective treatments exist and are supported with evidence (Graham 2015). Ineffective, haphazard, delayed, and in some cases even harmful implementation of treatments not only affects peoples' health, but undermines the integrity of the health systems meant to improve the public good – regionally, nationally, and internationally. Addressing this misalignment is truly an ethical imperative of our times.

This research proposal outlines an empirical investigation of the specific role of the public research funder, in turning the research it funds/supports into practical results. This particular piece of the puzzle is one that is under-studied and poorly understood (McLean et al. 2012; Smits & Denis 2014). Indeed, research conducted on knowledge uptake and implementation is of growing significance and attention, but little in this field has examined the role of the financier. This research will take an international, interdisciplinary scope, and will critically examine research funders' activities, successes, and failures in turning knowledge into action. Though the focus will be on health research funders, the findings may well be of interest to research funders in other disciplines (e.g., social sciences, engineering, etc.) as well.

As this research aims to build upon a limited body of work (discussed further in the literature review) it proposes to fill an identified knowledge gap. The new data – and the international scope it represents – will offer a state of the art assessment of KT strategies at health research funding agencies. An additional and entirely unique value of this research will be the longitudinal dataset it will develop; which is aligned to the pre-existing research of Tetroe et al 2008; Cordero et al 2008. The synthesis and analysis of data over time will offer a novel review and perspective on health research funding agency trends and strategies for turning research into action.

## 2) Research objective and specific questions to be addressed

The over-arching objective of this research is to:

***Further knowledge of the role of public research funders in the process of knowledge translation. Where appropriate and possible, highlighting and critically assessing practical, auditable actions on the part of funders which have led to improved KT.***

To do so, the study will undertake empirical review of the current activities and outcomes of an international sample of public health research funders. Further details on the research scoping, approach, and methods of data collection and analysis, are provided in the later sections of this proposal. Here, research questions designed to support the study objective are presented.

**Specifically, this research will address the following research questions:**

1 – What roles do research funders currently play in the KT processes of the research they support?

2 – What roles do research funders see for themselves (current & future) in the process of KT? What are the positive and negative implications perceived by funding agencies?

3 – Which roles have been evaluated? What, if evaluations exist, can be deduced about efficacy of KT support activities?

4 – Does the synthesis of primary data collected across funders, or funders programs/activities, provide new or higher quality knowledge about common or divergent practice? If possible, successful, or unsuccessful practice?

5 – What trends at current and in time-series in funders KT support - regionally, longitudinally, disciplinary, by type of funding organization (etc.) – can be identified? What can be learned about future directions from these trends and is this in-line with existing evidence?

6 - What effect(s) does context have on the practices of research funders? (Particular lens on Southern and Northern contexts with other variables to be inductively produced through empirical review.)

By addressing these questions, the proposed research aims to generate new knowledge about the state of the art in research funder support of KT. It is plausible that the research will produce knowledge that is used in conceptual, instrumental, and symbolic ways. Not all research should produce and translate across the full spectrum of this framework (conceptual, instrumental, and symbolic), however, the practical and empirical nature of this study design would appear to support each type of utilization. For instance:

- Conceptual knowledge as per the significant gap in the understanding and discussion about the current activities and results of research funders in KT.

- Instrumental knowledge as per the practices which have proven effective, and under what conditions.
- Symbolic knowledge as per the use of evidence surrounding the roles of funding agencies to persuade decision-makers at funding agencies to uptake and learn from practical experience.

## 3) Brief synopsis of relevant literature to be explored

In this proposal I refer to the conversion of knowledge into action as knowledge translation (KT). The Canadian Institutes of Health Research (CIHR), has defined KT as: *"a dynamic and iterative process that includes synthesis, dissemination, exchange, and ethically-sound application of knowledge"* (CIHR 2013). Having been adopted by the World Health Organization, the CIHR definition is generally internationally accepted and will form the starting point for my analysis. Adopting this definition also underscores the importance of a thorough grasp of the 'grey literature' produced by funders for the success of this study. This is primarily because the research will focus on funders' attempts to implement practical KT interventions (strategies to promote and facilitate the use of research) and most documentation of these efforts is reliant on the publications of the funders implementing the strategies. For instance, the South African Medical Research Council (SA MRC) has embedded this principle into its overarching Vision, Mission and Mandate statements, and has operationalized these aims through various research endeavors, partnerships, and targeted funding opportunities (SA MRC 2015). It is noteworthy that much of the literature this project will examine will be collected from the work of funding agencies such as the SA MRC, and that much of this is not published in academic journals and indexed in standard databases such as MEDLINE. Research and documentation such as MSFHR 2012, CIHR 2013, SA MRC 2015, IDRC 2015, as a few leading examples, document KT intentions, strategies, and even evaluations of past practice. The upside of this situation is that the majority of this research and documentation is open access and publically accessible. The Methods section of this proposal outlines the grey literature review strategy in practical detail.

That being said, the work of health research funders in KT has been documented in academic research, although to a minimal extent. Leading empirical academic research studies on the topic include the work of Tetroe et al. (2008) and Cordero et al. (2008). Both studied the efforts of health research funding agencies "support and promotion" of KT. The Tetroe et al. (2008) study incorporated a sample of 33 High Income Country (HIC) funders, while the Cordero et al. (2008) study examined 26 Low and Middle Income Country (LMIC) funders as well as international funders. Both studies concluded that funding agencies held roles of great potential for stimulating KT, but that further research and evaluation of these efforts was required.

In 2014, Smits & Denis, took a similar approach to reviewing the activities of research funders (only in 13 HIC countries) and concluded that the role for the funder in getting science and research into policy and practice

was paramount. They concluded that the examination of the role of the funder was relatively novel and beyond the scope of the typically applied KT frameworks and discourse. This conclusion provides contextual grounding for this research proposal.

At the same time these empirical reviews were being conducted, Mitton et al. (2007) and Contandriopoulos et al. (2010) undertook systematic reviews of the KT literature, including literature characterizing the role of funders. Both of these reviews provide additional and valuable contextual grounding for the research proposed here, although neither draw significant findings or recommendations for research funders. However, Mitton et al. (2007) suggest that the current state of practical, case-based review employed by research funders to examine their interventions in KT does not meet the standard of evidence quality to be expected since the advent of the evidence-based medicine movement. This criticism foreshadows the paradox in KT highlighted in McLean et al. (2012): that the current set of practical interventions to promote and support KT (the process of getting evidence into action) is itself not well evidenced. One can conclude that this literature demonstrates the need for further empirical study and evaluation of KT interventions, including those undertaken by funders.

In a recent narrative review performed by Greenhalgh and colleagues in 2016, the role for research funding agencies in KT is examined from the point of view of defining and evaluating 'research impact'. The perspective held in this review is that many actors, including funders, are facing increased pressure to demonstrate a social return on research investment. The narrative review finds that a multiplicity of roles for supporting KT exist, that these roles are contextually bounded, and that knowledge is intertwined with policy and persuasion. The authors conclude that the study of research impact is a multi-disciplinary endeavor that spans the broad field of evidence-based medicine. They highlight a particular shortcoming in the field is that the majority of investigation in taking place only in high-income countries and is related to the health research systems of North America, Europe, and Australasia. They argue for a broader view of research impact to incorporate the settings of Africa, Asia, Latin America and other parts of the Majority world (Greenhalgh et al. 2016). This finding has been duly incorporated into the research proposal presented hereafter.

Finally, this study is predicated upon recent empirical research examining the desires of the two primary stakeholders of the research funding organization – the public (the research funder's funder) and the research community (the research funder's primary beneficiary). In this research, both of groups have asserted clearly that governments pay attention to increasing research use and researchers' capacity to make their outputs useful (Wilson et al. 2010; Sutherland et al. 2012). In other words, increased attention to the promotion and support of KT. For publically funded health research to be socially relevant and actionable I believe we require deeper examination of how these activities are implemented, managed, coordinated, and evaluated.

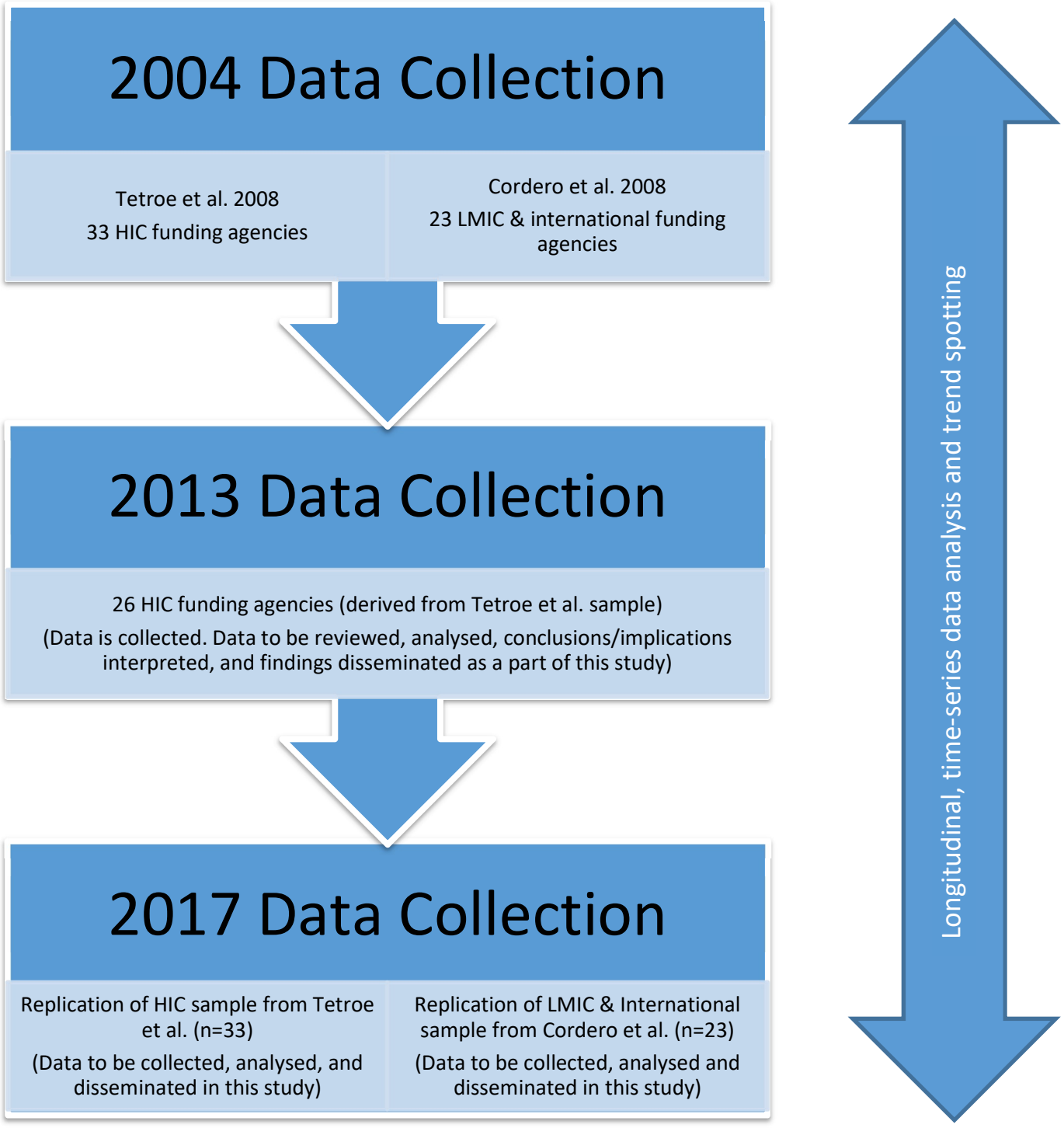
## 4) Methodological approach

The research will be conducted using a longitudinal, multi-source, mixed methods (qualitative and quantitative) design.

The technical research design will also include knowledge-user engagement. At the outset of the research process a series of knowledge-user partners will be identified. These will be decision maker representatives of health research funding agencies. This approach will be aligned with what is described by CIHR as Integrated Knowledge Translation research (iKT) (CIHR 2013). It will be employed to increase the relevance and significance of the study design, as well as, to increase the chance of knowledge uptake and implementation. The process of knowledge-user partner engagement will be advanced upon approval of this proposal and initiation of the study. At this stage, interest in principle has been ascertained from the Global Alliance for Chronic Disease, the Canadian Institutes of Health Research, and Canada's International Development Research Centre.

Figure 1 provides an illustration of the research approach. The issues outlined in the remainder of this section of the proposal (context, sample, data collection, data analysis, limitations) should each be considered in consultation with the approach outlined in Figure 1.

**Figure 1 – Overall longitudinal research design**



**Context**

The research design stems from the work of the Canadian Institutes of Health Research to evaluate their Knowledge Translation Funding Program (CIHR 2013). In McLean et al. (2012) the overarching design of an evaluation of the CIHR KT Funding Program is articulated as a part of a broad exercise to explore the role of the research funder in KT. This intention will be directly advanced with the research project proposed here. Furthermore, the design of this research will be such that an international examination of both Southern based and Northern based health research agencies will be included in order to broaden perspectives, include innovative ideas, and increase the opportunity for learning from 'outside the box' for all involved. As noted in the literature synopsis of this proposal, the value of a global perspective has been called for by the recent systematic review conducted by Greenhalgh et al. (2016) and is therefore also an important academic gap-filling objective of this research.

**Sample frame for the international funding agency scan**

The research is designed to provide a follow-up and expansion on the work of Tetroe et al. 2008, Cordero et al. 2008, and a full analysis, interpretation, and articulation of the data collected in McLean et al. 2012. The research will draw its sample of funding agencies from the samples contacted in these studies. As such, it will generate a new data-set for analysis and interpretation. At the same time, it will contribute to a longitudinal and coordinated series of research, thus allowing time-series and cross-contextual examination of the role of research funders in KT. Figure 1 above illustrates how the study design will allow for 3 points of time-series data, spanning 13 years (assuming 2017 data collection), and potentially 56 research funding agencies. It is perceivable that funding agencies will have changed status over time (eg. closed, expanded, merged, re-purposed, etc.). If this has occurred a systematic process for treating the instance will be implemented. The primary objective will be to keep a comparable, longitudinal dataset. Decisions regarding how to treat a change in status at a funding agency will be made on a case by case basis, adhering foremost to this principle.

Research intended for commercial profit will not be included in this study. When the design of the funding arrangement at a public agency includes commercial interests, the case will be sampled-out. Should commercialization strategies emerge as a major approach during initial web-based reviews of funding agencies, this element of the research design (sampling-out commercialization) will be revisited with the research supervisors. However, earlier phases of this research or the larger literature base do not indicate this will be the case, and neither does the institutional knowledge of the Candidate who is working in a research funding agency at current.

In the first studies (Tetroe et al. 2008 & Cordero et al. 2008 & McLean et al. 2012), Kuzel's (1992) "judgement" sampling approach was employed to select funding agencies based on particular criteria of interest to the research team undertaking that study. These criteria were: 1) nationally scoped agencies and other disease specific voluntary health organizations, and; 2) agencies that represented a continuum in or contrast in their KT support activities. Although these criteria are as relevant today as they were in 2004 and 2013, the follow-up nature of data collected from the same organizations at this third point in time (2017) is the more compelling justification for attempting to

replicate the sampling frames. In fact, the follow-up data provide not only new knowledge about KT practices at funding agencies, but also, useful indications of change in approaches to support for KT at funding agencies around the world. In context, such data provide a surrogate or proxy measure for broader change in the public sector role in evidence-based medicine and evidence-based decision-making. There has been a call for increased support for these concepts in the academic community since 2004 and this research provides a measure of the success these calls have had in infiltrating the plans and the policies of the research funders who would support and facilitate it.

**Data Collection Protocol**

*Website Reviews and Agency Templates*

A data collection template will be developed to gather information from the website and accessible publications of each funding agency. These templates will be based on the data collected in the earlier research studies (keeping to the view of providing a t1-t2-t3 analysis) and the theoretical categorization of KT activities provided by Lavis et al. (2006) as: Push, Pull, Linkage and Exchange. In addition, the full analysis and interpretation of data collected as a part of the McLean et al. (2012) protocol will be performed as a first step in this research project. It is expected that the results of this analysis will provide valuable grounding for the design of the precise protocol for 2017 data collection. At the minimum the templates will be populated with information such as mandate, annual budget, types of KT support activities, and KT evaluation activities. Following population of this initial web-based template, the templates will be sent via email to senior members of each agency for validation, updating, and addition of data that were not available on the agency website or in publications that were accessible. The agencies will be then asked to return the completed template to our study team, at which point a telephone/skype interview will be requested and scheduled between the researcher and the agency representative.

*Semi-Structured Qualitative Interviews*

I will aim to conduct telephone interviews with at least two representatives of each agency, one senior representative of the KT function of the agency and one senior representative of the evaluation function of the agency. These two key persons at each agency will be interviewed based on the expert knowledge they possess of the KT activities undertaken at the organization and the actions undertaken to evaluate these KT support activities. It should be noted that in some cases the two senior officials may be the same individual, at some agencies an evaluation function will not exist, and at some agencies a larger group of representatives may wish to take part in the interview process. The interview protocol will be based on the completion of the agency template, a discussion of the strengths and limitations of the template given contextual factors at that particular agency, and any exploratory/probing questions based on the flow of the discussion and emergent data of interest. This approach will allow a deductive learning exercise driven by the predefined template, but also, the compliment of this data with unstructured discussion on why and how any KT activities were being implemented, and will allow the interviewer to probe further on issues of particular interest at each agency (Crabtree & Miller 1992).

It is expected that all interviews will be conducted by telephone or skype. Should the opportunity arise to conduct an interview in person, it will be seized. The interview will be designed to last between 30 and 90 minutes. To minimize the threat of description or interpretation bias following the interview the notes and the completed agency templates will be returned to each agency for validation.

**Data Analysis Protocol**

Following the data collection protocol detailed above, data will be analyzed using accepted and leading standards. Quantitative analysis will not require statistical software or a statistician.

*Development of a question-driven analysis framework*

At the outset of the study the research questions will be used to develop an analysis framework for classifying, comparing, aggregating, and more generally analyzing data. The systematic application of a question-driven analysis framework will facilitate the research objective of generating cross-cutting learning about international trends in KT at research funding agencies. It will also keep the research focused. The framework will be designed to allow for the documentation of not only the KT process within an agency or project, but equally important, the environment in which the process occurred. Understanding the environment in which experience is observed will prove critical to holistically understanding findings and their implications.

Though the use of the framework will guide overall analysis, data analysis will not constitute a 'checklist' approach built against pre-determined indicators. The framework will be a dynamic construct and elements will be adapted to emergent findings of the research, where appropriate and consistent with the over-arching research questions.

At this early stage of research design, it is expected that the question-driven analysis framework will align to the Push-Pull-Linkage & Exchange model of funding agency KT activities of Lavis et al. 2006. Box 1 below provides illustration of how this conceptual framework might be used to classify funder activities in this research project, with examples. This classification will be done by the researcher following discussion with the funding agency to ensure understanding and fit. It is not expected that agencies will have ex-ante classified programs and interventions according to this framework.

**Box 1 – Push-Pull-L&E; A proposed theoretical model**

**Push** – activities and programs targeted at the 'pushing' of research produced knowledge into the hands of appropriate knowledge users - users who may not have otherwise been aware of the research and its implications. Push activities are sometimes referred to as end-of-grant KT. Examples of this include research communications targeted funding or typical end-of-grant funds an agency may provide a researcher to encourage the dissemination of findings.

**Pull** – activities and programs which facilitate knowledge users' access to research results. An example would be the forum where researchers are brought to discuss an issue of importance to a group of knowledge user(s).

**Linkage and exchange** – activities and programs which support the establishment of partnerships between researchers and knowledge users through multiple parts of the process of research design, execution, and/or dissemination. Linkage and exchange is alternatively referred to as integrated knowledge translation. An example would be a research grant that required both a researcher and a knowledge user to apply in partnership for funding.

It is important to note that the identification of the best theoretical model to analyze data against is difficult to discern prior data collection. Once data collection is underway the researcher will review alternative models with his supervisors (and perhaps other experts such as engaged study KUs) for suitability and feasibility of use. To ensure rigorous and systematic data collection, the research will thus be primarily guided by the research questions, and the expected use of the question-driven analysis framework.

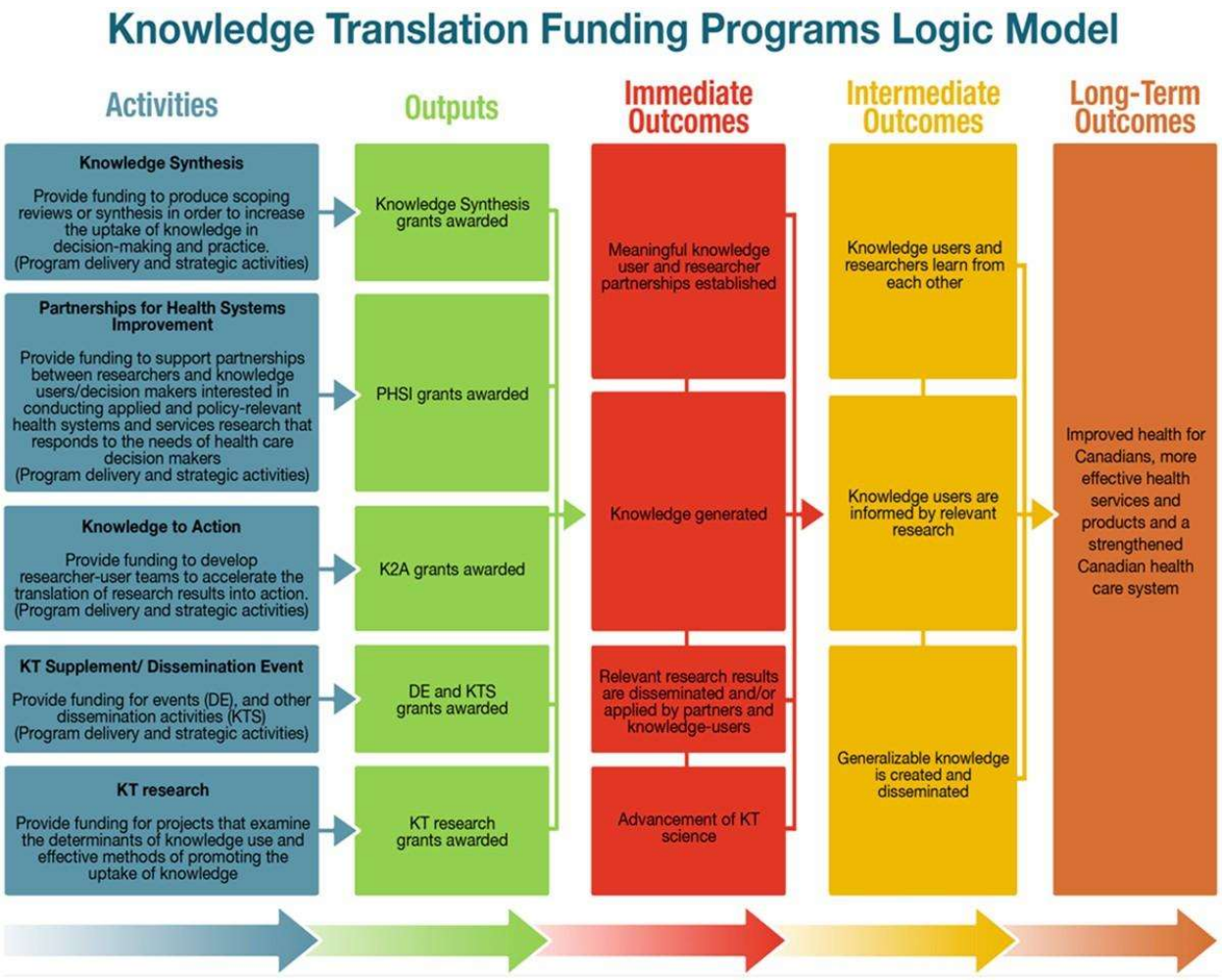
*Triangulating data from multiple sources and methods*

The methods of data collection and analysis described above fit together as part of a data triangulation strategy. To begin, data collection between these two methods will be sequentially carried out in order to iteratively influence the design of subsequent components. Once collected, both quantitative and qualitative data will be analyzed to recount key individual experiences using constant comparative analysis (*i.e.*, taking data and comparing it to others that may be similar or different). The multiple sources of data will uphold rigor in the analysis because findings from each component will be cross-checked for consistency and investigated where discrepancies arise (eg. agency documentation of KT practices will be discussed with agency staff responsible for implementing KT programs, and vice versa).

Modelling the process of KT at the research funding agency

To model the process of change expected from a KT funding program McLean et al 2012 developed a conceptual logic model of activities, outputs, and outcomes. This logic model is helpful to this research for demonstrating the areas of lesser known results of KT interventions by funding agencies. In effect, as the results of a program moves further from the locus of control of the funding agency (the left side of the model in Figure 2 below) the less is known about impact and effect. That being said, this research will aim to synthesis documented learning about all levels of intended results including activities and outputs.

Figure 2 – KT Funding Program Logic Model




**Source**: McLean et al. 2012
**Note**: This model was built specifically for the Canadian Institutes of Health Research activities. The concept of knowledge to action it outlines is general.

**Perceived limitations**

Based on rigorous design, thoughtful implementation, and previous experience I am confident that the methodological approach will allow for the capture of an accurate snapshot of KT activities at each agency. However, I will not interview all departments or branches of each agency, and therefore the research cannot claim with absolute certainty that all KT activities have been recorded.

A second limitation of the methodology stems from a potential lack of interest in participation from the funding agencies contacted for the study. Several methods may be used to mitigate this possibility. For one, the professional affiliations of the proposed researcher to the Canadian Institutes of Health Research (Canada's national health research funder), and the International Development Research Centre (an international research funder) may be used to increase involvement of contacted agencies. Second, the standing of the two supervisors of this research project with the South African Medical Research Council and community more generally (Dr. Volmink) and the Canadian Institutes of Health Research and community (Dr. Graham) may also leverage agency interest in becoming involved. Lastly, the experience of the earlier research conducted to initiate this study indicates this issue is unlikely to arise as funding agencies are interested in further study on this topic for their own instrumental or symbolic uses.

## 5) Practical notes and considerations

**Ethical requirements**

The research will involve human participants and will be submitted for ethical approval by the Ethics Committee of the Faculty of Medicine and Health Sciences, Stellenbosch University. The research will not be of high ethical risk to participants, the researcher, or the general public. The research will not include human biological materials or animals. The original manuscript to be included in this dissertation by publication process was published with ethics approval of the Ottawa Hospital, though these have now expired and did not cover the scope of the research proposed here.

**Dissertation by publication**

The proposed research will be completed under the guidance and supervision of Dr Jimmy Volmink (Stellenbosch University) and Dr Ian Graham (Ottawa University). This includes: problem formulation, scoping, question design, protocol design, data collection, analysis approach, drawing of conclusions and implications, and the reporting and dissemination strategy.

Dissertation by academic publication has been elected to report major findings of the research in order to optimize the training for the proposed candidate, support the over-arching study objective, and best document and share the results. Annex 1 of this proposal outlines the planned strategy of publication in full detail. One paper that

was previously published (within 5 years) will be included in the dissertation. This paper is closely matched to the overall program of research being undertaken in the PhD. For reference and review, it is provided as an attachment to this proposal.

**Place and timing of research**

The proposed candidate will be fully registered as a South African international student through the course of doctoral studies. All requirements for university student status, formal and informal (e.g., degree of availability for supervision and other university guidance/participation) will be met.

Being a Canadian citizen, it is expected that the student will spend time during the course of this research located outside of South Africa. This will not affect the research design, has been discussed with the supervisors and is well addressed through the support of both an Ottawa-based and Stellenbosch-based supervisor.

**Work and study**

The proposed candidate is a current employee of the Canadian Institutes of Health Research and is currently seconded to Canada's International Development Research Centre. Primarily, this is seen as an advantage to the proposed research plan. It provides the candidate with a valuable professional perspective, an understanding of the contextual influences affecting the research topic, and a favorable understanding of the needs of potential research users and uses.

**Funding**

Funding required for the study will be minimal. Primarily it will consist of Skype and telephone expenses for the conduct of international key informant interviews and the cost of publishing in open access journals. Secondarily, and where possible, travel expenses to attend meetings of knowledge-users (funding agencies) and pertinent conferences to present research findings.

Funding for the candidate will be required and several sources have been immediately procured. Dr Ian Graham agrees to provide primary funding to the candidate under the provisions of a CIHR Foundation Grant for which he is Principal Investigator. Dr Graham was awarded this grant to establish a program of research examining Knowledge Translation and this proposal is matched to the grant objectives. This grant was awarded in 2015, holds a 7yr duration, and is valued at 3.3 million Canadian dollars. It includes a team of Canadian and international researchers and knowledge users. Many of the knowledge users are health research funders – whom will be directly interested in the results of this project.

If accepted to the Doctoral program the candidate will aim to leverage financial support from IDRC and CIHR (his co-employers) for the duration of this research project. This arrangement will not require co-funding of the University, though it will require documentation of student status. The topic of research has been discussed and

planned with the employers and both encourage the proposal and hold interest in its results and how they might inform their planning and funding activities. Furthermore, both perceive value in the Faculty of Medicine and Health Sciences of Stellenbosch University, and the academic support of field leaders Dr Volmink and Dr Graham as an appropriate incubator for a positive research process and result.

The candidate will seek tuition support from Stellenbosch University (support toward payment of international fees). However, the candidate will not require extraordinary funding from the University for living expenses or other costs. When suitable funding opportunities arise at the University the candidate will apply where appropriate and encouraged by his supervisors to do so.

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## Annex 1 – Schedule of proposed publications

| Paper (Research questions addressed) | Objective | Research skills to be required & demonstrated | Status | My role |
|---|---|---|---|---|
| 1) Investigating the Role of a Research Funding Agency in KT; Evaluation Study Protocol<br><br>*Addresses research questions: 1&2* | To advance knowledge regarding the role of a funding agency in supporting KT.<br><br>(The paper presents the background, methods, analytical approach of the over-arching evaluation of the role of a health research funding organization in supporting KT.) | - Ethics approval received from Ottawa Hospital<br>- Literature Review<br>- Presentation of methodology and data collection protocols<br>- Discussion of study implications and eventual use | Published in 2012 in *Implementation Science*<br><br>*Rated as "highly accessed"* by BioMed Central<br><br>Has received over 10, 000 downloads and online views. | I led the design of the paper, performed the literature review presented in the paper, led the design of the protocol presented in the paper, drafted the paper.<br><br>In addition I led the process of ethics approval from the Ottawa Hospital REB. |
| 2) 2012 KT International Funding Agency Scan<br><br>*Addresses research questions: 1, 2, 3, 4* | To compile an international stock of the types of work being undertaken by research funding agencies in KT and initiate a discussion of the implications of the research for funding agencies and researchers. | - International scoping of funding agency role in KT<br>- Website & document reviews<br>- In-depth qualitative interviews (n=26)<br>- Literature review<br>- Descriptive quantitative data analysis<br>- In-depth qualitative data analysis | Data collection has been completed.<br><br>Analysis, interpretation of findings and write-up of paper to be completed as initial phase of this research.<br><br>Findings will be used to position further data collection in follow-up study. | I led the design of the study protocol and data collection approach.<br><br>I will lead the design of the analysis techniques of the research. I will lead design and writing of the paper. |

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| | | - Discussion of implications and conclusions | | |
| 3) 2017 Funding Agency Scan (LMIC, HIC, and international sample)<br><br>*Addresses research questions: 1,2,3,4* | **Objective:** Present the 2017 state of the art in health research funders support of KT.<br><br>Engage Northern, Southern, and international funders to create a truly global stock of knowledge. | - Use emergent data and context to design study protocol<br>- Literature review<br>- Execute international data collection strategy<br>- Qualitative and quantitative data analysis<br>- Reporting of findings and conclusions | Study to be initiated in 2017. | I will seek renewed ethics approval for the study (if required).<br>I will design the study protocol and data collection approach.<br>I will lead the design of the analysis techniques of the research<br>I will lead the design and writing of the paper. |
| 4) 2004 – 2017 Time Series Analysis of Evolving Role of the Research Funder in Supporting KT<br><br>*Addresses research questions: 4,5,6* | To synthesize data across 3 periods of time, and multiple participants, to investigate longitudinal and cross sectional trends. | - Advanced qualitative and quantitative time-series data analysis<br>- Interpretation of large data set for trend-spotting<br>- Reporting of findings and conclusions | Study to be initiated upon conclusion of paper 3. | I will lead the design of the analysis techniques of the research.<br>I will lead design and writing of the paper.<br><br>I believe that there may be sufficient data for multiple papers addressing the research questions. At minimum, one will be produced. |

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| 5) Expert Panel Review of Key Research Findings<br><br>*Addresses research questions: 4,5,6* | Convene a panel of expert knowledge users (research funders) to engage in a deliberative process of review and interpretative review of research findings, significance and potential utility. | -Protocol design for a facilitated deliberative review process<br>- Recruit and engage research knowledge users<br>- Facilitate deliberative review<br>- Report on outcomes, key findings, and conclusions of panel | To conclude all data collection and analysis. | I will design the deliberative review panel.<br>I will facilitate and lead data collection from the panel.<br>I will lead design and writing of the in collaboration with panel members (knowledge users). |
| **Potential supplementary paper for case-specific contribution** | | | | |
| 6) Quantitative Investigation of Integrated-KT<br><br>*Example of a case-study of emergent interest from the research.*<br>*I include this paper as a placeholder for any number of additional publications that would add supplementary benefit to the PhD research project. Additional papers will be negotiated with the supervisors so as to not distract effort from the core research objective.* | To advance knowledge of iKT as a method to promote and improve the social impact of health research. | - Design of quantitative data analysis techniques<br>- Advanced quantitative data analysis (with statistician review and support as appropriate)<br>- Reporting of findings and conclusions | To be conducted at appropriate stage of studies 3 & 4 | I will lead the design of the analysis techniques of the research.<br>I will lead design of the paper.<br>I will lead author the paper. |

# APPENDIX 3

## *Ottawa Hospital Research Ethics Board approval letter*

Coverage: *Funders' KT* research stream

UNIVERSITY OF OTTAWA HEART INSTITUTE
INSTITUT DE CARDIOLOGIE DE L'UNIVERSITÉ D'OTTAWA

uOttawa

*Ottawa Hospital Research Ethics Boards / Conseils d'éthique en recherches*

725 Parkdale Avenue, Box 411, Ottawa, Ontario K1Y 4E9 613-798-5555 ext. 14902 Fax: 613-761-4311
http://www.ohri.ca/ohreb

January 17, 2012

Dr. Ian Graham
Canadian Institute of Health Research
160 Elgin, 9th Floor, 4809A
Ottawa, On
K1A 0W9

Dear Dr. Graham:

**Re: Protocol # 2011718-01H Evaluation of CIHR Knowledge Translation Funding Programs**

**Protocol approval valid until - January 16, 2013**

Thank you for your e-mail dated January 16, 2012. I am pleased to inform you that this protocol underwent expedited review by the Ottawa Hospital Research Ethics Board (OHREB) and is approved. No changes, amendments or addenda may be made to the protocol or the consent form without the OHREB's review and approval.

Approval is for the following documentation:
- Protocol dated February 7, 2011
- Interview Guide for funded knowledge users, received October 6, 2011
- Interview Guide for funded researchers, received October 6, 2011
- English Questionnaire - KT synethesis - received October 6, 2011
- English Questionnaire - KT K2A - received October 6, 2011
- English Questionnaire - KT MPD - received October 6, 2011
- English Questionnaire - KT OOGP - received October 6, 2011
- English telephone interview instrument received October 27, 2011
- English contact letter received October 27, 2011
- English quantitative survey letter received December 22, 2011
- English key informant interview letter received December 22, 2011
- English expert review panel (case studies) letter received December 22, 2011

The validation date should be indicated on the bottom of all consent forms and information sheets (see copy attached). If the study is to continue beyond the expiry date noted above, a Renewal Form should be submitted to the OHREB approximately six weeks prior to the current expiry date. If the study has been completed by this date, a Termination Report should be submitted.

The Ottawa Hospital Research Ethics Board is constituted in accordance with, and operates in compliance with the requirements of the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans; Health Canada Good Clinical Practice: Consolidated Guideline; Part C Division 5 of the Food and Drug Regulations of Health Canada; and the provisions of the Ontario Health Information Protection Act 2004 and its applicable Regulations.

Yours sincerely,

Raphael Saginur, M.D.
Chairman
Ottawa Hospital Research Ethics Board

/cb

# APPENDIX 4

## *Stellenbosch University Health Research Ethics Committee approval letter*

Coverage: *Funders' KT* research stream

UNIVERSITEIT
STELLENBOSCH
UNIVERSITY

**Health Research Ethics Committee (HREC)**

**Approval Notice**

**New Application**

26/09/2018

**Project ID :**7801

**HREC Reference #:** S18/07/148

**Title:** Incentives and innovation

Dear Mr Robert McLean,

The **New Application** received on 25/07/2018 09:57 was reviewed at a convened meeting of **Health Research Ethics Committee 2 (HREC2)** on 21/09/2018 and was approved.

Please note the following information about your approved research protocol:

Protocol Approval Period: **This project has approval for 12 months from the date of this letter.**

Please remember to use your **Project ID [7801]** on any documents or correspondence with the HREC concerning your research protocol.

Please note that the HREC has the prerogative and authority to ask further questions, seek additional information, require further modifications, or monitor the conduct of your research and the consent process.

**After Ethical Review**

Please note you can submit your progress report through the online ethics application process, available at: Links Application Form Direct Link and the application should be submitted to the HREC before the year has expired. Please see *Forms and Instructions* on our HREC website (www.sun.ac.za/healthresearchethics) for guidance on how to submit a progress report.

The HREC will then consider the continuation of the project for a further year (if necessary). Annually a number of projects may be selected randomly for an external audit.

**Provincial and City of Cape Town Approval**

Please note that for research at a primary or secondary healthcare facility, permission must still be obtained from the relevant authorities (Western Cape Departement of Health and/or City Health) to conduct the research as stated in the protocol. Please consult the Western Cape Government website for access to the online Health Research Approval Process, see: https://www.westerncape.gov.za/general-publication/health-research-approval-process. Research that will be conducted at any tertiary academic institution requires approval from the relevant hospital manager. Ethics approval is required BEFORE approval can be obtained from these health authorities.

We wish you the best as you conduct your research.

For standard HREC forms and instructions, please visit: Forms and Instructions on our HREC website https://applyethics.sun.ac.za/ProjectView/Index/7801

If you have any questions or need further assistance, please contact the HREC office at 021 938 9677.

Yours sincerely,

Mr. Francis Masiye ,

HREC Coordinator,

Health Research Ethics Committee 2 (HREC2).

*National Health Research Ethics Council (NHREC) Registration Number:*

*REC-130408-012 (HREC1)•REC-230208-010 (HREC2)*

*Federal Wide Assurance Number: 00001372*
*Office of Human Research Protections (OHRP) Institutional Review Board (IRB) Number:*

*The Health Research Ethics Committee (HREC) complies with the SA National Health Act No. 61 of 2003 as it pertains to health research. The HREC abides by the ethical norms and principles for research, established by the World Medical Association (2013). Declaration of Helsinki: Ethical Principles for Medical Research Involving Human Subjects;the South African Department of Health (2006). Guidelines for Good Practice in the Conduct of Clinical Trials with Human Participants in South Africa (2nd edition)*; as well as the Department of Health (2015). Ethics in Health Research: Principles, Processes and Structures (2nd edition).

*The Health Research Ethics Committee reviews research involving human subjects conducted or supported by the Department of Health and Human Services, or other federal departments or agencies that apply the Federal Policy for the Protection of Human Subjects to such research (United States Code of Federal Regulations Title 45 Part 46); and/or clinical investigations regulated by the Food and Drug Administration (FDA) of the Department of Health and Human Services.*

# APPENDIX 5

## *Government of Canada's Treasury Board Secretariat 'Directive on Results'*

Establishes oversight and policy hierarchy for Canadian Government agency data collection, retention, and reporting for agency-housed evaluation research.

Coverage: *Scaling Science* and *Research Quality Plus* research streams

# Government of Canada - Directive on Results

**Reference, complete Treasury Board of Canada Evaluation Policy Suite governing ethics in the collection, retention, and reporting of primary and secondary data in federal evaluations.**

**Further supporting legislation, Government of Canada, Policy on Results: https://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=31300**

## 1. Effective date

- 1.1This directive takes effect on July 1, 2016.
- 1.2

  It replaces the following Treasury Board directive and standard:

  - Directive on the Evaluation Function (2009)
  - Standard on the Evaluation for the Government of Canada (2009)

## 2. Authorities

- 2.1The authorities described in section 2 of the Policy on Results apply to this directive.

## 3. Objectives and expected results

- 3.1The objectives of this directive are outlined in the Policy on Results.
- 3.2The expected results of this directive are outlined in the Policy on Results.

## 4. Requirements

- 4.1

  The Performance Measurement and Evaluation Committee designated under subsection 4.3.3 of the policy is responsible for the following:

  - 4.1.1

    Reviewing and advising the deputy head on the establishment, implementation and maintenance of the Departmental Results Framework and Program Inventory with its related Performance Information Profiles, particularly with respect to the following:

        - 4.1.1.1The alignment between the Departmental Results Framework and the Program Inventory;
        - 4.1.1.2The availability, quality, utility and use of planned performance information and actual performance information; and
        - 4.1.1.3The information technology application and tool requirements, based on advice from the department's chief information officer;
    - 4.1.2

      Reviewing and advising the deputy head on departmental evaluation planning and activities, including the adequacy of the following:

        - 4.1.2.1Annual evaluation needs assessment exercises, evaluation coverage and resources for evaluation;
        - 4.1.2.2The departmental evaluation plan; and
        - 4.1.2.3Plans for specific evaluations, if requested by the head of evaluation;
    - 4.1.3Reviewing evaluation reports and summaries, including management responses and action plans, and recommending approval to the deputy head;
    - 4.1.4Monitoring follow-up on evaluation recommendations and action plans and advising the deputy head of any issues;
    - 4.1.5Reviewing and advising the deputy head on the availability, quality, utility, and use of performance information including evaluation; and
    - 4.1.6Reviewing and advising the deputy head on the neutral assessment of the evaluation function.
- 4.2

  Heads of performance measurement designated under subsection 4.3.5 of the policy are responsible for the following:

    - 4.2.1Establishing, implementing and maintaining the Program Inventory in accordance with the Mandatory Procedures for Results Frameworks, Program Inventories, Performance Information Profiles and Programs and with the Standard on Tagging based on advice from the head of evaluation and in consultation with Treasury Board of Canada Secretariat officials;
    - 4.2.2Ensuring that the Treasury Board of Canada Secretariat receives performance information, including indicator data and metadata, on all programs in the Program Inventory as requested;
    - 4.2.3Ensuring that Performance Information Profiles exist and are being implemented for each program;
    - 4.2.4Reporting, at least annually, to the Performance Measurement and Evaluation Committee, on the availability, quality, utility and use of performance measurement data related to the Program Inventory;
    - 4.2.5Advising the Performance Measurement and Evaluation Committee on the availability, quality, utility and use of indicators in the Departmental Results Framework; and

- 4.2.6Demonstrating in their work the competencies for heads of performance measurement as established by the Secretary of the Treasury Board of Canada.

- 4.3

  Program officials designated under subsection 4.3.6 of the policy are responsible for the following:

  - 4.3.1

    Establishing, implementing and maintaining Performance Information Profiles for their designated Programs in accordance with the Mandatory Procedures for Results Frameworks, Program Inventories, Performance Information Profiles and Programs and with the Standard on Mandatory Outcomes and Performance Indicators, in consultation with head of performance measurement and head of evaluation, and ensuring that valid, reliable, useful performance data is collected and available for the following purposes:

    - 4.3.1.1Managing programs;
    - 4.3.1.2Assessing the effectiveness and efficiency of programs; and
    - 4.3.1.3Meeting the performance information requirements of Treasury Board of Canada submissions, evaluations, and central agencies;
  - 4.3.2Providing deputy heads with written verification that all performance information, including evaluations, contained in Treasury Board submissions related to their program is valid, reliable and accurately represented, and that the head of evaluation has been consulted; and
  - 4.3.3Collaborating with the head of evaluation and evaluators in the conduct of evaluations and evaluation planning exercises.

- 4.4

  Heads of evaluation designated under subsection 4.3.12 of the policy are responsible for the following:

  - 4.4.1Supporting program officials in verifying for each relevant memorandum to Cabinet and Treasury Board submission that plans for performance information and evaluations are sufficient and that information on past evaluations is accurately represented and balanced;
  - 4.4.2Advising the Performance Measurement and Evaluation Committee on the validity, reliability of Departmental Results Indicators in the Departmental Results Framework, including their usefulness for supporting evaluations;
  - 4.4.3Advising program officials on the availability, quality, validity, and reliability of the indicators and information in the Performance Information Profile, including their utility for evaluation;
  - 4.4.4

    Reporting to the Performance Measurement and Evaluation Committee at least annually on the following:

        - 4.4.4.1The implementation of approved management action plans in response to evaluation recommendations;
        - 4.4.4.2The impacts of evaluations including lessons learned, corrective actions taken and influence on resource allocation decisions;
        - 4.4.4.3The delivery of evaluations as set out in the departmental evaluation plan and, for approved evaluations, the timeliness of transmission to the Treasury Board of Canada Secretariat and of public release; and
        - 4.4.4.4The availability, quality, utility and use of performance information to support evaluations;
    - 4.4.5Assessing evaluation needs through an annual departmental evaluation planning exercise and developing an annual five-year departmental evaluation plan, in accordance with subsection 2.2 of the Mandatory Procedures for Evaluation;
    - 4.4.6Following review and recommendation for approval by the Performance Measurement and Evaluation Committee, obtaining the approval of the deputy head for the departmental evaluation plan;
    - 4.4.7Submitting to the Treasury Board of Canada Secretariat the annual departmental evaluation plan and releasing, as required by subsection 4.3.16 of the policy, the planned evaluation coverage described in subsection 4.3.15, excluding subsection 4.3.15.1;
    - 4.4.8Obtaining the deputy head's approval of evaluation reports and summaries;
    - 4.4.9Submitting evaluation reports and summaries to the Treasury Board of Canada Secretariat and releasing on web platforms as required by subsections 4.3.17 and 4.3.18 of the policy;
    - 4.4.10Demonstrating in their work the competencies for heads of evaluation as established by the Secretary of the Treasury Board of Canada;
    - 4.4.11Ensuring that departmental evaluators demonstrate in their work the competencies for evaluation specialists established by the Secretary of the Treasury Board of Canada;
    - 4.4.12Ensuring that departmental evaluators have opportunities to develop their competencies and to earn evaluation-related designations or certifications from recognized professional associations and certifying bodies;
    - 4.4.13Ensuring that evaluations are undertaken in accordance with the Mandatory Procedures for Evaluation and the Standard on Evaluation;
    - 4.4.14Consulting with the Treasury Board of Canada Secretariat when developing annual five-year departmental evaluation plans and on the identification of programs of grants and contributions for use in monitoring; and
    - 4.4.15Informing the head of communications of survey research included in the departmental evaluation plan, at least for the first year of the plan, before departmental evaluation plans are approved.
- 4.5The department's chief financial officer is responsible for verifying, in writing, the accuracy of the planned and actual financial expenditures reported to the Treasury Board of Canada Secretariat for each Program in the Program Inventory, as well as the financial data associated with departmental performance information, when it is provided to the

Treasury Board of Canada Secretariat to inform Treasury Board submissions, memoranda to Cabinet, centrally-led evaluations, and resource alignment reviews.

- 4.6

  The department's chief information officer is responsible for the following:

  - 4.6.1Seeking advice from the Treasury Board of Canada Secretariat on standard information technology applications and tools and on reporting templates to support the implementation of the policy;
  - 4.6.2Working to ensure that the department has the necessary information technology applications and tools to support the timely collection and use of quality performance data by departments, including machine-readable qualitative information, and to support the reporting of information to the Treasury Board of Canada Secretariat when requested, in the prescribed structure; and
  - 4.6.3Advising the head of performance measurement and the Performance Measurement and Evaluation Committee on the department's information technology application and tool requirements or informing them of updates to requirements associated with the Departmental Results Framework, Program Inventory, and the Performance Information Profiles.
- 4.7The department's chief human resources officer or chief financial officer is responsible for verifying, in writing, the accuracy of planned and actual human resources information (in full time equivalents) reported to the Treasury Board of Canada Secretariat for each Program in the Program Inventory.

# 5. Roles of other government organizations

- 5.1The roles of other government organizations are described in section 5 of the policy.

# 6. Application

- 6.1This directive applies to the organizations described in section 6 of the policy.
- 6.2

  For small departments and agencies, as defined in subsection 6.2 of the policy:

  - 6.2.1Subsections 4.1.6, 4.2.6 and 4.4.10 do not apply.
  - 6.2.2Subsections 4.1.2.2 and 4.4.6, only apply in cases where a small department or agency chooses to develop an evaluation plan.
  - 6.2.3Subsections 4.4.4.1 to 4.4.4.3 only apply where departments undertake evaluations. References in subsection 4.4.4.3 to the departmental evaluation plan should be taken to refer to the schedule of evaluations resulting from the departmental evaluation planning exercise, if any.
  - 6.2.4Subsection 4.4.5 only applies with regard to the annual departmental evaluation planning exercise.
- 6.3

For agents of Parliament, as identified in subsection 6.3 of the policy:

  - 6.3.1Where these organizations are not small departments and agencies, all sections of the Directive apply except as otherwise noted in this section. Where these organizations are small departments or agencies, this directive applies as outlined in subsection 6.2, except as otherwise indicated subsections 6.3.2 to 6.3.5.
  - 6.3.2Subsection 4.3.1.3 does not apply as it relates to central agencies, except as required for Parliamentary reporting or resource alignment reviews.
  - 6.3.3Subsection 4.4.14 does not apply.
  - 6.3.4The element of subsection 4.2.1 regarding consulting with Treasury Board of Canada Secretariat officials does not apply.
  - 6.3.5The elements of subsections 4.4.4.3, 4.4.7, 4.4.9, and 4.6.2 that require reporting to the Treasury Board of Canada Secretariat do not apply, except as required to support Parliamentary reporting and resource alignment reviews.
- 6.4Parliamentary entities, as identified in subsection 6.4 of the policy, are exempt from all requirements of this directive.
- 6.5Crown corporations are exempt from all requirements of this directive.

# 7. References

- 7.1The references listed in the Policy on Results apply to this directive.

# 8. Enquiries

For interpretation of any aspect of this directive, contact Treasury Board of Canada Secretariat Public Enquiries.

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# Appendix A: Mandatory Procedures for Departmental Results Frameworks, Program Inventories, Performance Information Profiles and Programs

## A.1 Effective date

- A.1.1These procedures take effect on July 1, 2016.
- A.1.2They replace subsections 6.1.2 to 6.1.4 of the Directive on the Evaluation Function (April 1, 2009).

## A.2 Requirements

- A.2.1These procedures elaborate the requirements outlined in subsection 4.3.1 of the Policy on Results and subsections 4.2 and 4.3 of the Directive on Results.

- A.2.2

  The Departmental Results Framework includes the following:

  - A.2.2.1Core Responsibilities;
  - A.2.2.2Departmental Result(s), and their relationship to government priorities and mandate letter commitments as prescribed by the Treasury Board of Canada Secretariat; and
  - A.2.2.3

    Performance Indicators for the Departmental Result(s) including:

    - A.2.2.3.1Information on data type, data collection frequency, data source, data owner, targets (where appropriate), thresholds; and
    - A.2.2.3.2Descriptions for qualitative Departmental Result indicators.
- A.2.3

  The head of performance measurement, in establishing, implementing and maintaining the Program Inventory, must include the following:

  - A.2.3.1All departmental Programs, including those prescribed by the Treasury Board of Canada Secretariat;
  - A.2.3.2Designation of an official responsible for each program;
  - A.2.3.3A description of each program, how it relates to the Core Responsibilities and, where appropriate, how it influences the Departmental Results;
  - A.2.3.4Tagging with metadata as prescribed by the Treasury Board of Canada Secretariat in accordance with the requirements outlined in the Directive on Results' Standard on Tagging; and
  - A.2.3.5Identification of how the financial expenditures and human resources (in full time equivalents) of each Program in the Program Inventory are attributed to the department's Core Responsibilities and, where appropriate, to specific Departmental Results.
- A.2.4Planned and actual financial expenditures and human resources (in full time equivalents) attached to each program in the Program Inventory are to be reported to the Treasury Board of Canada Secretariat in a manner and timing prescribed by the Secretariat.
- A.2.5

  Program officials, in establishing, implementing and maintaining Performance Information Profiles for Programs, must include the following:

  - A.2.5.1The description of the Program provided for the Program Inventory (see section A.2.3.3 of these Mandatory Procedures), where appropriate, augmented with a logic model, program theory or similar program design tool;
  - A.2.5.2The outputs of the program;
  - A.2.5.3The outcomes of the program;

    - A.2.5.4The metadata provided for the Program Inventory (see section A.2.3.4 of these Mandatory Procedures);
    - A.2.5.5Valid and reliable indicators for outcomes and, where appropriate, for outputs of the program including relevant information on methodology, data type, data collection frequency, data source, data owner, targets and thresholds as appropriate for each indicator;
    - A.2.5.6Mandatory program outcomes and indicators prescribed by the Treasury Board of Canada Secretariat in accordance with the requirements outlined in the Directive on Results' Standard on Mandatory Outcomes and Performance Indicators;
    - A.2.5.7A summary of proposed evaluation needs, developed in collaboration with the head of evaluation;
    - A.2.5.8A list of relevant approved evaluations and external studies;
    - A.2.5.9A list of relevant major projects, transfer payment programs, services and horizontal initiatives related to the program, as appropriate; and
    - A.2.5.10Government-wide policy considerations such as gender-based analysis and official languages, where relevant.
- A.2.6Information and associated data collected on items noted in A.2.2, A.2.3 and A.2.5.6 of these mandatory procedures must be reported in a manner and timing prescribed by the Treasury Board of Canada Secretariat.
- A.2.7

  Program officials, in maintaining Performance Information Profiles for Programs, must:

    - A.2.7.1Consult with the head of evaluation and obtain approval of the head of performance measurement on any changes to their program's Performance Information Profile; and
    - A.2.7.2Respond to inquiries from the head of evaluation on progress implementing evaluation recommendations and the impacts of evaluations.

### A.3 Modifications

- A.3.1The Treasury Board of Canada has delegated to the President of the Treasury Board of Canada the authority to amend or rescind these mandatory procedures.

# Appendix B: Mandatory Procedures for Evaluation

### B.1 Effective date

- B.1.1These procedures take effect on July 1, 2016.
- B.1.2

  These procedures replace:

    - Subsection 6.1.3, 6.1.5 and 6.3.1 of the *Directive on the Evaluation Function* (April 1, 2009)

## B.2 Requirements

- B.2.1These procedures elaborate the requirements outlined in subsection 4.4 of the Directive on Results.
- B.2.2

  The head of evaluation is responsible for implementing the following procedures:

  **Planning departmental evaluation coverage**

  - B.2.2.1

    Ensuring that the annual departmental evaluation planning exercise identifies:

    - B.2.2.1.1Evaluations of all ongoing programs of grants and contributions with five-year average actual expenditures of $5 million or greater per year, as per subsection 2.5 of the policy, required to fulfill the Financial Administration Act subsection 42.1;
    - B.2.2.1.2Evaluations required by applicable legislation and as a result of commitments in submissions approved by the Treasury Board of Canada;
    - B.2.2.1.3Evaluations requested by the Secretary of the Treasury Board of Canada; and
    - B.2.2.1.4Evaluation activities required to support centrally-led evaluations or resource alignment reviews;
  - B.2.2.2

    Additionally, ensuring that the annual departmental evaluation planning exercise, starting from the principle that all programs and spending not covered by evaluation as a result of subsection B.2.2.1 of this Mandatory Procedure should be evaluated periodically, identifies the department's five-year evaluation coverage needs by considering:

    - B.2.2.2.1The need to evaluate ongoing programs of grants and contributions with five-year average actual expenditures of less than $5 million per year and assessed contributions to international organizations;
    - B.2.2.2.2Departmental and program risks, governmental and department priorities and the information needs of major stakeholders;
    - B.2.2.2.3Information needed to support the department's spending proposals, including Memoranda to Cabinet and Treasury Board submissions, as well as to support resource alignment reviews;
    - B.2.2.2.4The recentness and sufficiency of existing performance information for management, decision making, and accountability;
    - B.2.2.2.5Joint evaluations with other departments of government priorities, horizontal initiatives, and where departmental responsibilities, results or program outcomes are shared or related;
    - B.2.2.2.6Other planned departmental oversight activities; and

- B.2.2.2.7Advice from the Treasury Board of Canada Secretariat;

**Departmental evaluation plans**

- B.2.2.3A deputy head confirmation note, as outlined in subsection B.2.3 of these procedures, shall be included with approved departmental evaluation plans submitted to the Treasury Board of Canada Secretariat;
- B.2.2.4

  The annual five-year departmental evaluation plan identifies:

  - B.2.2.4.1The five-year schedule of evaluations to be undertaken in accordance with subsection B.2.2.1 and B.2.2.2 of these procedures;
  - B.2.2.4.2Specific evaluations and evaluation activities being undertaken as per subsections B.2.2.1.1 to B.2.2.1.4 and B.2.2.2.1 of these procedures;
  - B.2.2.4.3Evaluations of high-risk and high-priority spending, programs or other issues;
  - B.2.2.4.4For each evaluation scheduled for approval in the first year of the plan, the quarter in which it will be approved;
  - B.2.2.4.5The lead department for each evaluation that will be conducted jointly with other departments;
  - B.2.2.4.6Extent of planned coverage, including by amount of organizational spending and by program of the Program Inventory; and
  - B.2.2.4.7Extent of organizational spending and programs that will not be evaluated in the planning period, the key reasons for not evaluating, and the year in which the spending or program was last evaluated;

**Evaluations of ongoing programs of grants and contributions**

- B.2.2.5Evaluations of ongoing programs of grants and contributions with five-year average actual expenditures of $5 million or greater per year required to fulfill the requirements of the Financial Administration Act section 42.1, shall include an assessment of relevance, effectiveness and efficiency;

**Evaluation reports**

- B.2.2.6Draft evaluation reports are submitted by the head of evaluation directly and simultaneously to the deputy head and the Performance Measurement and Evaluation Committee;
- B.2.2.7Final approved evaluation reports are submitted to the Treasury Board of Canada Secretariat, as per subsection 4.3.17 of the policy, with a cover letter signed by the head of evaluation indicating the report's approval date; and
- B.2.2.8Evaluation reports and summaries, including complete management responses and actions plans, are released on web platforms, after they are approved by the deputy head as per subsection 4.3.18 of the policy, while safeguarding protected and classified information.

- B.2.3

  Mandatory Text for the Deputy Head Departmental Evaluation Plan Confirmation Note

  I approve the Departmental Evaluation Plan of [insert department's name] for the fiscal years [insert fiscal years covered by the plan], which I submit to the Treasury Board of Canada Secretariat as required by the Policy on Results.

  I confirm that this five-year rolling Departmental Evaluation Plan:

  - Plans for evaluation of all ongoing programs of grants and contributions with five-year average actual expenditures of $5 million or greater per year at least once every five years, in fulfillment of the requirements of subsection 42.1 of the Financial Administration Act
  - Meets the requirements of the Mandatory Procedures for Evaluation
  - Supports the requirements of the expenditure management system including, as applicable, Memoranda to Cabinet, Treasury Board submissions, and resource alignment reviews

  I will ensure that this plan is updated annually, and I will provide information about its implementation to the Treasury Board of Canada Secretariat, as required.

  Signature: [Insert signature of the deputy head including date of signature]

### B.3 Amendments

- B.3.1The Treasury Board of Canada has delegated to the President of the Treasury Board of Canada the authority to amend or rescind these mandatory procedures.

# Appendix C: Standard on Evaluation

### C.1 Effective date

- C.1.1This standard takes effect on July 1, 2016.
- C.1.2

  It replaces the following Treasury Board of Canada instruments:

  - The Standard on Evaluation for the Government of Canada (2009)
  - Annex A of the Directive on the Evaluation Function (2009)

### C.2 Requirements

- C.2.1This standard elaborates on the requirements set out in the Mandatory Procedures for Evaluation.

- C.2.2

  The standards are as follows:

  - C.2.2.1

    Evaluations:

    - C.2.2.1.1Are directed by the head of evaluation;
    - C.2.2.1.2Are carried out by an evaluator or evaluation team that possesses the knowledge and competence required and that adopts roles and responsibilities that are articulated in writing at the outset of the evaluation;
    - C.2.2.1.3Have objectives and purposes that are clearly stated at the outset of the evaluation and that meet the needs of evaluation users;
    - C.2.2.1.4Are planned with consideration of the risks and complexity associated with the policy, program, priority, unit or theme being evaluated;
    - C.2.2.1.5Are planned with consideration of using relevance, effectiveness and efficiency as primary evaluation issues, where relevant to the goals of the evaluation;
    - C.2.2.1.6Are planned to take into account government-wide policy considerations, where relevant, such as gender-based analysis and official languages.
    - C.2.2.1.7Are guided, where relevant, by an advisory or steering committee chaired by the head of evaluation or a delegate;
    - C.2.2.1.8Have a clear, robust approach, design and methodology that is documented at the outset of the evaluation, and that allows for the collection and analysis of valid, reliable data;
    - C.2.2.1.9Include sufficient and appropriate consultation with major stakeholders;
    - C.2.2.1.10Include multiple lines of quantitative and qualitative evidence to support findings and conclusions;
    - C.2.2.1.11Are conducted in a neutral manner and with integrity in their relationships between evaluators and stakeholders;
    - C.2.2.1.12Are designed and managed so as to deliver value for money for Canadians in terms of the use of evaluation resources;
    - C.2.2.1.13Are subjected to quality assurance including peer reviews where appropriate; and
    - C.2.2.1.14Are completed and approved in a timely manner so that they can be used appropriately, effectively and efficiently.
  - C.2.2.2Individuals involved in evaluations are informed of the level of confidentiality and privacy that is afforded them under the Privacy Act.
  - C.2.2.3Contracted external evaluators comply with the Mandatory Procedures for Evaluation and this Standard, and are free from any actual or perceived conflict of interest.

- C.2.2.4The requirements set out in subsection C.2.2.3 are reflected in all contracting agreements with external evaluators.
- C.2.2.5Actual or perceived conflicts of interest that arise with regard to evaluations are addressed promptly so as not to compromise evaluation processes or results.
- C.2.2.6

  Evaluation reports:

  - C.2.2.6.1Are written and presented clearly and concisely;
  - C.2.2.6.2Include the information required to understand and reasonably sustain findings and conclusions;
  - C.2.2.6.3Provide readers with an appropriate context for the evaluation and the policy, program, priority, unit or theme being evaluated;
  - C.2.2.6.4Identify the limitations of the evaluation in a way that informs readers about the reliability of findings and conclusions;
  - C.2.2.6.5For evaluations of program outcomes or outputs, include an accurate assessment of the contribution of the program to its related government priorities and/or departmental results and priorities;
  - C.2.2.6.6Present a logical flow of findings, conclusions and recommendations;
  - C.2.2.6.7Identify any exposure to risks noted through the evaluation;
  - C.2.2.6.8Include clear, actionable recommendations that aim to address the key issues or concerns identified;
  - C.2.2.6.9Include a management response and action plan prepared by the responsible program official or relevant manager(s).

## C.3 Amendments

- C.3.1The Treasury Board has delegated to the Secretary of the Treasury Board the authority to amend or rescind these requirements.

# APPENDIX 6

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